

A

B.L.

T R E A T I S E

O N

The MANNER of Raising
FOREST TREES, &c.

In a Letter from the Right Honourable,
Haddington.
The Earl of —— to his Grandson.

To which are added,

Two MEMOIRS; the one on Preserving
and Repairing FORESTS; The other
on the Culture of FORESTS.—
Both translated from the FRENCH of
M. DE BUFFON of the Royal
Academy at Paris.

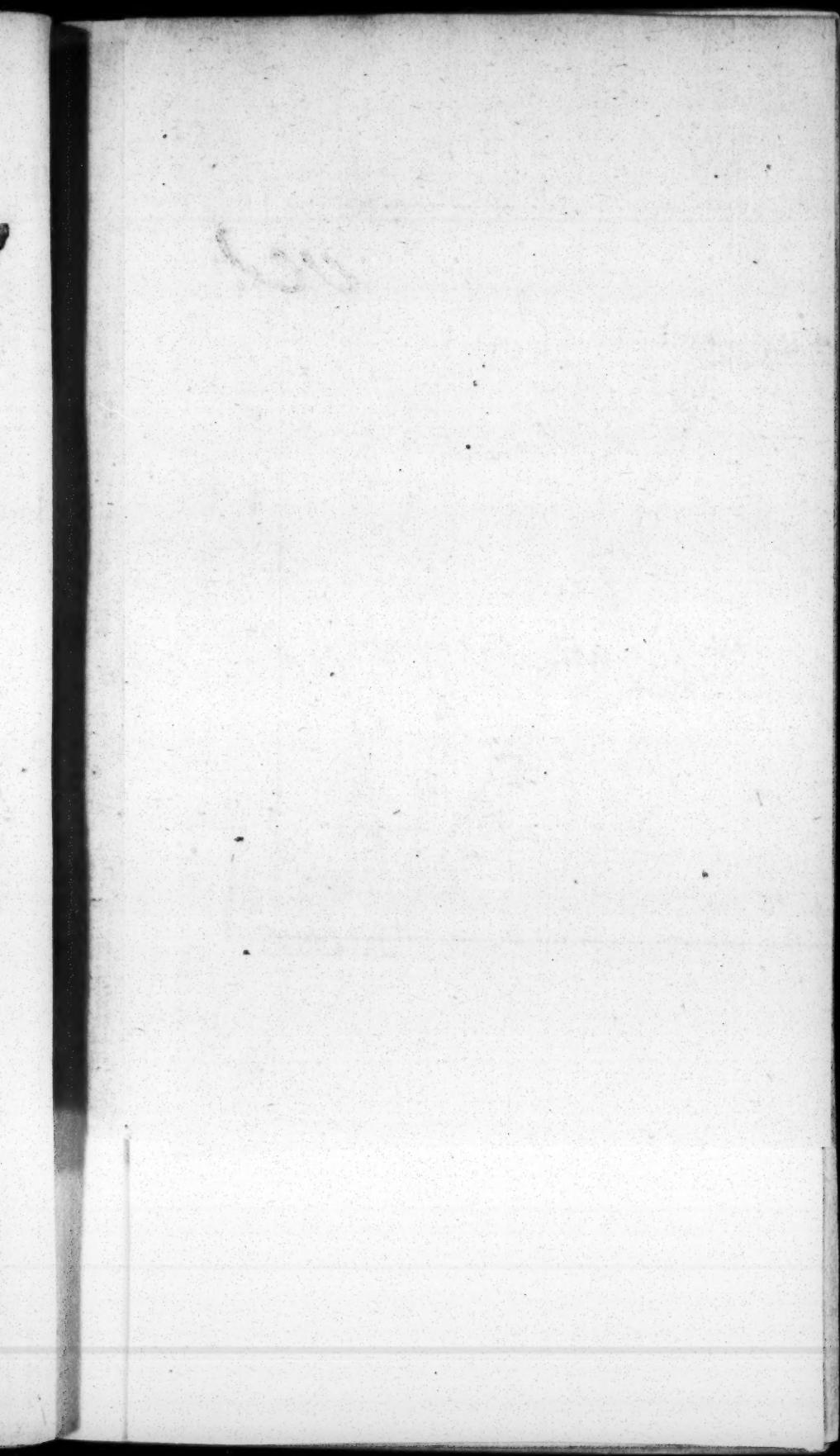
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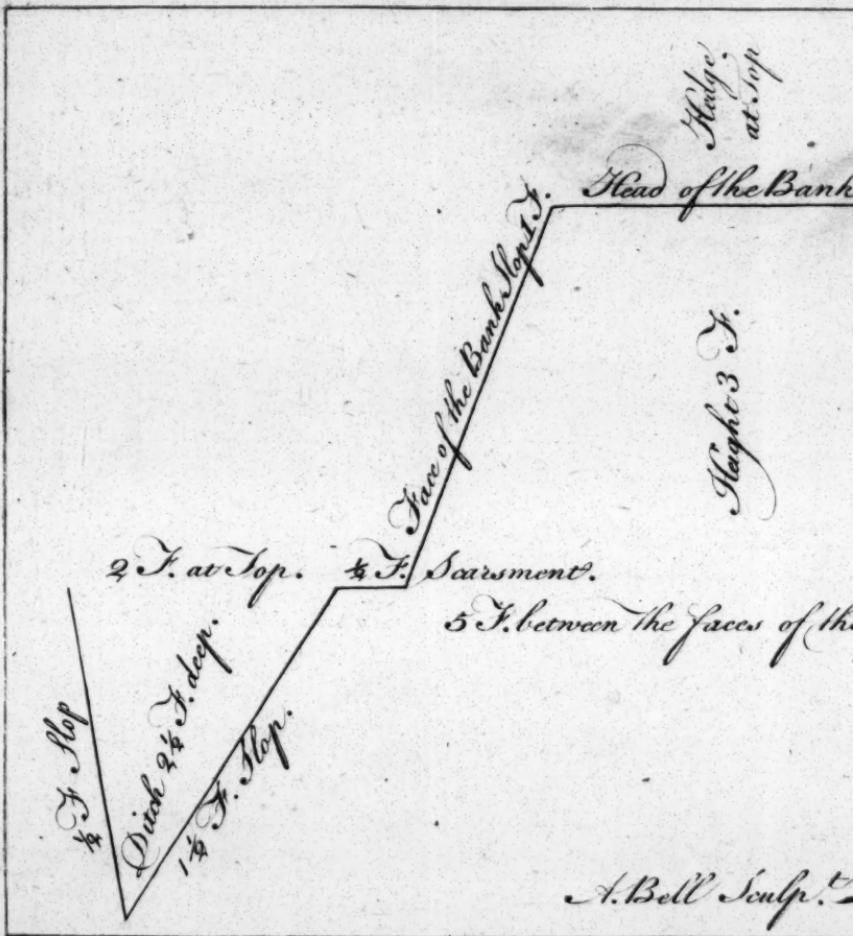
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M,DCC,LXI.

22

W. Musgrave.







A. Bell Sculp.

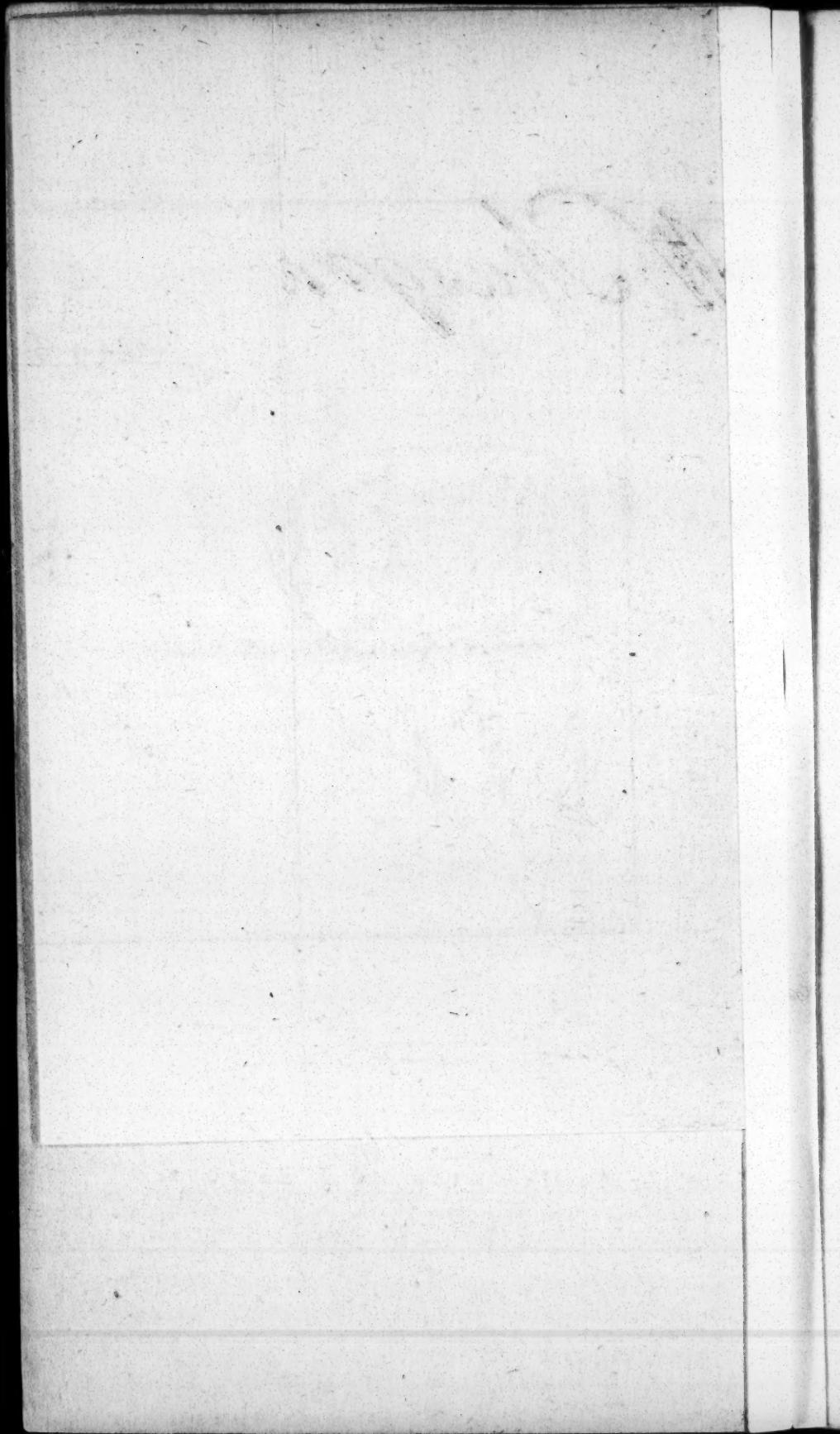
long;
at. top

The Bank 3 F.
Slope of the Bank Slope.

Scarsments & F.
Places of the two Banks.

Sculpt.

2 F. at Top.
1 $\frac{1}{2}$ F. Slop.
Ditch 2 & F. deep.
 $\frac{1}{2}$ F. Slop.



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T R E A T I S E

O N

The Manner of raising Forest Trees, &c.

In a LETTER from the Right Honourable
the Earl of —— to his Grandson.

WHEN I came to live in this place,
in the year 1700, there were not
above fourteen acres set with trees.
I believe the reason was, that it was a re-
ceived notion in this country, that no trees
could grow here, because of the sea-air, and
the north-east winds: so that the first of our
family that lived here, either believing the
common opinion, or not delighting in plant-
ing, made no attempts that way. My grand-
father came late to the estate, and the civil
wars in the time of King Charles I. did not
permit him to stay at home, (for, being lame,

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he could join neither side); but when they were over, he tried to raise some trees, which he planted round the house and gardens. There were indeed but two rows of them; but I make no doubt he would have gone on, if death had not prevented him. My father succeeded him, who, as I have been told, both loved and understood planting, as well as any man in his time: He began to plant, to drain, and enclose his grounds to very good purpose, and I question not would have gone on in the same way; but his father-in-law dying, he went to take possession of the estate in right of my mother, who was heiress, and settled at Leslie; where he planted a great deal.

As I was then very young, I staid at Leslie with my mother, and this place was let to tenants. They pulled up the hedges, plowed down the banks, and let the drains fill up so, that, when I came to reside here, every thing of that kind was in ruins, except the thickets to the east and west of the house.

As I was not then of age, I took pleasure in sports, dogs, and horses; but had no manner of inclination to plant, inclose, or improve my grounds; but, being at last obliged to make some inclosures, for grazing my horses, I found the buying of hay very expensive; this made me wish to have enough of my own; yet I did little or nothing of that kind

kind for some years; but, as your grandmother was a great lover of planting, she did what she could to engage me to it; but in vain. At last, she asked leave to go about it; which she did; and I was much pleased with some little things that were both well laid out and executed, though none of them are now to be seen: For, when the designs grew more extensive, we were forced to take away what was first done. Though the first Marquis of Tweeddale, my Lord Rankeilor, Sir William Bruce, my father, with some others, had planted a great deal; yet, I will be bold to say, that planting was not well understood in this country, till this century began. I think it was the late Earl of Mar that first introduced the wilderness way of planting amongst us, and very much improved the taste of our Gentlemen, who very soon followed his example. I had given over my fondness for sport, and began to like planting better than I had done; and I resolved to have a wilderness. I fixed upon some ground near my bowling-green; I laid it out in a centre with fourteen walks from it, the most of them having tolerable good terminations; but as it was too little, in some years I enlarged it greatly; and your father, who had an admirable taste, put it in the figure it is now in. The growth of it is very surprising, considering how few years it is since it was planted; but as I take that to be owing to

some reasons that are fitting for you to know, I shall tell them here. The ground for the most part was rich, and what was not, was very favourable for trees: I made trench it very well; the plants were young, and they were set close together; the soil not of a stiff binding nature, so as to keep the water from running through, as some clays are. Tho' trenching in such soils opens the ground, as far as the spade goes; yet below that, the ground is so firm, that the rain can go no further, but stays as in a dish: This chills the roots of the trees, and makes them canker at top, and by degrees die downwards. Whoever has the misfortune of such a soil, though he should trench it never so well, ought to set his trees upon the surface, and throw earth upon the roots to keep them fixed, that the roots may put out when they best can; but where my wilderness stands, the roots had freedom to run any where. Setting trees deep is a dangerous error, every where to be shunned. This method of planting which I took, I believe, was an excellent one, for the following reasons.

I have already told the advantage of trenching; *2d^o*, The youngness of the plants make them take root sooner than if they were elder, and the ground becomes natural to them. *3d^o*, The setting them close together, makes every tree shelter another, and so rise the faster. I know some people make objections

jections to what I advance, but I hope to answer them all to your satisfaction.

First, They say, trenching is expensive; and then the keeping the ground from weeds and grafts, costs labour, and of course money. To this I answer, I own it is so; but as it is to be but once trenched, and the keeping clean is only necessary for two years; nay, if after trees are planted, and turnip-seed sown amongst them, it will keep down the weeds for the first summer; and if they are dug in the beginning of winter, they do the trees so much service, that the cleaning after is but a trifle. Whoever loves to see their trees thrive, when they try this method, I hope will not grudge it to their wilderness, or near their house; for, in the course of this paper, you will find, I propose cheaper ways of planting than, I believe, ever any recommended.

Objection 2. That it takes a great many plants. I answer it doth; but, as I hope to shew, tree-seeds are not dear, especially if got from our own trees, or from a friend; and I shall demonstrate, that a seed bed is made at a small expence; and I advise that all trees (almost) should be planted out for you after they have stood two years from their peeping above ground; but as some seeds lie longer by near a year than others, I shall distinguish them as I mention the different kinds of trees.

Obj. 3. By this way of planting, a great many trees must be lost ; for, being set so close they must kill one another, since it must impoverish the ground so much, that it is not able to give nourishment to them. To this I answer, I have shewn, that seeds are cheap, and shall shew that the raising of them costs little. Besides, trees set close together, assist one another in running up ; but as some will always thrive better than others, those who prosper will, with their shade, and dropping upon the smaller ones, make them dwindle, and die at last ; and if so, the loss is but small, though I propose to cut down these unthriving ones, and perhaps they may shoot up for underwood, and by frequent cutting over, they may yield some profit, and can do no harm to the more thriving ones, that are left uncut. This has been my practice, tho' I was advised to lift the unthriving ones, and plant them somewhere else ; but this I could not agree to ; for in taking them up the spade must cut the roots of them that are designed to stand : so that I think the cutting them over much the better way. As for the ground's not being able to nourish so many trees, I have seen a nursery, that was neglected ; the plants at first, having been set within a foot of one another, run up to a great height, and even grown so great, that they almost touched one another. Now, by means of cutting down, they will not require so much nourishment ;

ment; but, if it should be suspected that they drew too much juice from the trees left to stand, it is very easy to cut them below ground, to kill them. As to wildernesses, it is probable I shall have occasion to speak of them afterwards; but I shall go on to give you an account of the progres of planting about this place.

After the wilderness (I mean the little thing with the straight walks) was finished, your grandmother came to me, with another proposal. There was a field of three hun-Scots acres, each one fifth larger than an English acre, called the muir of Tynningham, that was common to some of my tenants, and a neighbouring Gentleman, the ground of ver-ry little value, except some small part of it, for which one of my tenants paid a trifle of rent. This ground she desired to inclose and plant; it seemed too great an attempt, and almost every body advised her not to under-take it, as being impracticable; of which number, I confess, I was one; but she said, if I would agree to it, she made no doubt of getting it finished. I gave her free leave; the Gentleman and tenants had their losf made up to them; and, in the year 1707, she began to inclose it, and called it *Binning-wood*. Af-ter she had begun to plant it, I thought it would be a pity not to have a centre in it, and walks from it, with the best terminations we could find: For that end I traversed the ground,

ground, till I found what I wanted. I told this to my wife, who went and looked at it, liked it very well ; but walking about, lighted on a spot of ground that she thought more proper for a centre. I preferred my choice, she her's ; but knowing that the Earl of Hop-toun, the present Earl of Marchmont, and the late Sir John Bruce, were to be here in a few days, we resolved to leave the determination of this controversy to them.

When they came, we all went to the field. The spot your grandmother had pitched on was the first we came to ; here she stopped, and said what she could in praise of her choice. I begged to go on to mine ; but my Lord Marchmont said, it would be best to set up the instruments there, and to take the views and walks ; when that was done, he would go forwards, and do the like at mine ; and when both were laid down on paper, it might be judged which was best. In the mean time, Sir John Bruce had straggled from us, and sent to tell, he had lighted upon a finer spot of ground for a centre, than either of the two we were contending for : My Lord Marchmont sent him the same answer he had given me ; and when he had ended what he had to do at mine, he went and did so at the place where Sir John was at. When we returned to the house, he laid down the whole field on paper, with the three centres, and the walks from each of them. When this was shewn,

shewn, it was agreed unanimously, that all the three should be laid out on the ground; and the planting carried on by that plan. This was done, and stands so to this day, with very little variation; only, that there are some serpentine walks, and some figures, laid down by your dear father, when he was but ten years old. An incredible number of trees are planted in this field; but I shall say nothing about the method that was taken, because I am to tell you how every kind of tree is to be managed. I shall only say, that all who see it express themselves highly pleased with it.

I now took pleasure in planting, and in inclosing; but, because I did not like the husbandry practised in this country, I got some farmers from Dorsetshire. This made me divide my ground; but as I knew the coldness of the climate, and the bad effects the high winds had, I made strips of planting betwixt every inclosure, some forty, fifty, or sixty feet broad, as I thought best. These look very well, and I hope will be a great shelter, and come to warm the ground. From these Englishmen we came to the knowledge of sowing and management of the grass seeds; a thing of so great advantage, that I intend to write something on that head to you, after I have finished what I have to say about trees. After making inclosures and strips of planting, I turned my eyes to a piece of ground

near

near the house very barren, that carried nothing but furzes, or, as they are called here, *Wkins*. My father had planted some of it with birch; but having been spoiled by cattle in my minority, were very much stunted. I had cut them down some years before, and planted some other trees amongst them. Upon my going one year to London, I committed it to your father, who took it in hand, made it in walks, and now it is an exceeding pretty spot of ground; and as it every way differs from any thing about this place, it is liked by all that see it. This done, and your grandmother seeing the unexpected success of her former projects, went on to another, that all who heard of it were positive it would be to no purpose.

The story is this: There is a large warren here close by the sea-side, vastly sandy: This, with several acres of arable, and pasture-land, was formerly let for a trifle; some years ago we found the rabbits (which were in great plenty, since what is called *Warren* was at least four hundred acres) came out upon the neighbouring grounds, destroyed much corn, and eat over what trees I had planted, or hedges that were near them. This made us demolish the warren, that is to say, root out the rabbits as much as we could; so that all this large field was laid waste, and only served to give a very little food to some sheep, and young black cattle; but still we did not repent

FOREST TREES. 11

repent the destroying of the rabbits. A Gentleman, who had lived some time at Hamburgh, one day walking with your grandmother, said, That he had seen fine trees growing upon such a soil. She took the hint, and planted about sixty or seventy acres of this warren. All who saw it thought that the time, labour, and trees, were thrown away ; but, to their great amazement, they saw them prosper as well as in the best grounds. The whole field was dead sand, with scarce any grass on it ; nor was it only so poor upon the surface, but continued so some yards down. The next thing that was fallen upon, was a field so poor, that, after bestowing more labour and manure on it than it was worth, yet the next year it was as bad as it had been before. I resolved to fight no more with it, and planted it all ; and I cannot say but it answers very well. As I have a great deal more of such kind of land, I design to plant it all.

Thus, my dear child, I have given you a kind of historical account of the beginning and progress of planting here. I shall now go on to give you my opinion, of the best method of raising and planting the different kinds of trees, in use in this country. And, as I am sure, I shall differ from all that have written on this subject, yet you may depend on it, I shall tell you nothing, but what I have

have experience of, and when I say any thing I have only by report, I shall warn you of it.

CHAPTER I.

I Have read all the books I could lay my hands on that are in English on the subject of planting, (and they are not few in number;) some good things are to be met with in most of them, though there are none that I intirely agree with. John Evelyn, Esq; seems to have had great skill; but his language is affectedly cramp; he shews, in my mind, too much regard to the age of the moon, and other niceties, that I think absolutely unnecessary: He is tedious, and makes too many digressions; but in the main is a good author. I have been much indebted to him, and shall have occasion to mention him often. Moses Cook was gardener to the Earl of Essex, and wrote much about the same time; he seems to have understood his business; and his book has been of great use; yet in many things I differ widely from him. Many have written since; but the most part have only been transcribers from these two, even to letting down their errors, and have added many more of their own. Some have writ intirely like philosophers; but though no man

man can be the worse of philosophy, yet I am sure the affair of planting may be carried on very successfully with very little of it; so that what they say serves more to entertain, than to instruct the reader. However, there have been many useful discoveries made of late, and I hope there still shall be more; for my part I shall only set down what I know to be right from my own long experience. I shall begin with the different ways of raising trees. By seeds, is the most natural and common way; but some kinds do not carry any, or we have not got the knowledge of gathering and managing them. I know authors generally begin a dissertation upon the elements. Their next chapter is upon the different ways of propagating trees from seeds, suckers, layers, slips, and cuttings. I shall begin with the oak; and tell how it is to be raised; then how it is to be managed, till it is fit for the ax.—When I have done that, I shall write of all the other trees I have experience of in the same manner.

S E C T. I.

Of the Oak.

The oak is raised by the seed called the acorn. Authors mention different kinds in Britain; but I own I know nothing of it.

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I have raised many, but could never observe any odds amongst them. All my acorns came from England ; yet I think there must be more kinds than one ; for that which comes from abroad, and is used for barrels, and wainscoting, seems to be of a very different kind ; but I could never procure any acorns of this kind, though I am still in hopes of getting some of them. I have raised many oaks, by setting the acorns in the ground, where they are designed to stand, without being removed ; and I think it by far the best way, if the field-mice could be kept from destroying them ; because every time a tree is removed, it puts a stop to the growth. Where the ground was bare, as in Binning-wood, and the warren when it was begun to be planted, the acorns did very well : But, now that no cattle are allowed to eat the grafts, it is grown so rank, that it falls down in winter ; so that now it is so matted together, that the young shoots cannot force their way through ; besides the mice and other vermine harbour there. These two things have cost me many bushels of acorns. The way I have taken of late is, to make seed-beds after this manner. We trench a piece of good ground, and lay it out in beds, as gardeners do. On them the acorns are put with the sharp point to the earth, and then cover them about an inch deep. The best season for this work is, when the acorns drop in October ; but as I had

had mine from England, I never could set them so early, but I was sure to put them in the ground as soon as I got them, if it was not frost. After they peep above the ground, they ought to have some earth sifted upon them; for frost may swell the ground, so as to spew up some of the acorns: in that case, they must be put in again with a finger; if weeds come up, they must be carefully taken away. After they have been in this bed for two full years, and as much more as from the sowing-time in October, till the planting-time in February, some authors say, they should stand three years in the seed-bed, by a notion that the acorn in two years has not exhausted all its substance into the plant. But I have been very careful to observe that, and never could observe any part of the acorn not consumed. I propose, in the February after they have stood two years, that they should be planted out for good and all. I thought this had been a notion of my own; but since I began to use this method, I saw a wood planted by a gentleman after this manner, that was in a very thriving way. The things that put me upon altering the common custom was, that the trenching ground for nursery was both expensive and troublesome, for they must be kept clean; which is continual labour. Another reason I gave before, that every removal of a tree checks the growth; and the third reason was, that for

many years I had set out the firs from the seed-bed to where they were always to stand with great success: so that if I could raise all my trees from the seed without any removing, it would certainly be the best way; but I have given reasons why it cannot be done. In all the authors I have read, there is one positive order that I never follow, viz. the cutting off the top-root or the carrot root of the oak. I think it needless when they are taken from the seed bed, and I never intend to plant an oak another way. The writers on planting take up much time in advising the setting the same side of the tree to the sun that was to it before; but I think this is a nicety not worth the regarding. They likewise tell what sorts of soils are most proper for the oak; but as it is my favourite tree, I have planted it every where, and I can shew them very thriving on rich, poor, middling, heathy, gravelly, clayey, mossy, spouty, and rocky ground, nay even upon dead sand. And it is visible that the oak grows every where on my grounds faster than any other tree; some of the aquaticks only excepted.

Having said so much, I shall now mention something of what distance from one another the oaks should be set at. In natural woods the trees stand close, but in time the least thriving decay, by often cutting, and the dropping of the trees that are left for timber,
they

they perish by this means. Large oaks stand at a great distance; but I cannot allow that to be a good reason why, in new plantations, oaks should be set at forty, fifty, or sixty feet distance, far less (as some of our modern authors advise) at as many yards; for though they may see great trees stand so, yet it is more than probable these trees stood in a thicket, and the rest in time have been taken away. It is certain, if we should plant trees at that distance, particularly in a country so subject to winds, they might turn bushes perhaps, but never come to be what is called a tree. I have proved that acorns are not dear, nor doth it require much trouble or expence to raise them; so that should we lose nine in ten, it is but a trifle; but that may be saved too by planting less valuable trees among the oaks, that, by the cutting them down, may yield some profit, without doing any harm to the oaks; on the contrary, do them service, by keeping them warm, as I have said before in my answers to the objections against close planting; so that I think, if oaks are planted at twenty feet distance, and other trees set amongst them, it may do very well; and if afterwards, when they have destroyed the other trees, if they are thought to stand too near, they may be thinned at pleasure, and no fear but merchants may be got for such half-grown oaks. I now come to the pruning. No tree should be allowed to fork, I mean to

put out two stems, one upright shoot should only be suffered; for when there are two or more, the sap that should all run into one, and make it a good tree, is dispersed into many; and this neglect is the cause that millions of trees never come to the quarter of the value they would have arrived at, had due care been taken to have them trained up to one stem: So I recommend the beginning to prune them, and all other forest-trees, when they are young. At the same time, I am not for leaving the trees quite without branches; but I would have but few. If the tree has been neglected, begin at the undermost branches, take them and the next row clean away; but when you come higher up, only take off a branch here and there, or shorten some, which must be cut away by the body of the tree next season, and thin the head, so that the winds may get through; for if a tree is top-heavy, the wind will take such impression on it, that it will either break short, or be laid over; so that it will never grow a straight tree. By this way of doing, as I have proposed, a tree may be brought to what height one pleases, without any more branches than what are necessary. To draw up the slip, the clearest account of this, is to be met with in Moses Cook's book, in the chapter of oaks. The best time, I think, for pruning is after the sap is at rest, by a pretty hard frost; but tho' the branches are cut off at this season, many

many trees, particularly the oak, are very apt to put out small young shoots at the same place where the carriers were cut off. These should be cut off the midsummer after the first pruning ; and if done so for a few summers, the bark of the tree will grow so firm, that no more shoots will break out on the sides. Some people lop, (by that I mean cut the tops of the oaks) ; but I intirely disapprove of that practice, since the higher an oak is, the greater is its value. There is another way of managing oaks and other trees, that I think may be as good as pruning ; and that is, the nibbing off the faid buds in the spring. If this practice is begun when the trees are young, it will have very good effects ; since, by checking the sap's breaking out on the sides, it forces it to run up to the top of the tree. I shall not waste any time with telling the uses of this tree, since every body knows its value. And now I have said all that I thought needful of the management of this excellent tree, that has been so long called the *king of the forest*, and shall now treat of the beech.

S E C T. II.

Of the Beech.

Though they who have writ about trees, mention two kinds of beeches ; I know no difference.

difference. They are to be raised from the must ; and could it be preserved from vermin, should never be removed, but the seed set where it is to stand : But the mice, &c. are so fond of it, that I am forced to sow the must in a seed-bed, and treat this tree in every thing like the oak ; so I refer you to what is above. But there is one great difference ; for as the oak will thrive on almost any ground, the beech is very shy. In good ground it thrives very well, but not in clay or wet ; but for gravelly or dry sandy ground, none better. It is a beautiful tree ; and tho' when young, grows some time very crooked ; yet, as it grows older, will turn straight. It ought to be disbudded and pruned, as I directed of the oak. It makes a fine hedge for beauty in a wilderness, but I doubt it is not good for coppice-wood, since they say it doth rise kindly from the root, when cut down. But of this I have no experience ; it is very proper for walks, or avenues, or groves. But I think, were the timber of it less used for chairs, bed-steads, &c. it would be better ; for the worm takes it soon. In other countries, it gives a price for feuel ; but, as we have a great many coal-mines, I hope we shall never be reduced to cut our most beautiful trees for firing. Now I go on to

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S E C T. III.

Of the Elm.

There are many different kinds of this tree. I shall begin with what has grown long in this country, and is called the *Scots elm*. There are many huge trees of this kind, both as to stature and greatness, yet remaining, that if they had in their youth met with such disbudding and pruning as I have recommended, would have been surprisingly beautiful, and of great value; but they have been allowed to fork, and to run out into great arms, which is a pity, since the timber of it is both strong, of fine colours, and prettily veined, very little inferior (in my opinion) to some of the West-India woods so much run after for tables, chairs, chests and cabinets. It is propagated by the seed, which they carry plentifully almost every year. It has been some other elm than this, that Mr Evelyn says, ripens its seed in March and April; for this doth not ripen till the beginning or middle of June. It is a light seed, much like hop; it is to be gathered when ripe, which is known when the husk is full, and the seed firm. The way of sowing it, is; on a bed well trenched, and finely raked, lay the seed on pretty thick, and draw the earth (that has

has been thrust off with the back of the rake over the bed, as the gardeners do when they sow carrots. When the plants have sprung up half an inch, it will be fit to sift on some fine earth to fix them the better. Then keep them free from all weeds for two years, and then set them where they are to stand for good. I have always found this tree shyer as to the soil it grows on, than either the oak or the beech ; and I cannot say that they thrive, except upon good ground. In such ground as my wilderness, when trenched, they prosper exceedingly ; but as I have tried them every where, where they do not like the soil, they are scabby, stunted, hide-bound things ; and in my mind it is lost labour to plant them in poor weak ground. I am not sure if this tree is what in England is called the *witch-elm*. Another kind, with a leaf like that of the horn-beam, I have heard called the *London elm*. The long walk at Holland-house, and the incomparable one at Kensington (now hedged) is, of what I call the *London elm*. In the hedge rows about that city, this tree grows in great plenty ; and the custom is, to cut off all the side-branches close by the body of the tree, and only leave a very little head ; so that in winter, the country looks as if it were intirely inclosed by high hedges ; and in the spring, are as bare as may-poles, except the little head, that appears to be no bigger than a

broom

broom used in a stable. How often they repeat this operation, or what use they turn these prunings to, I cannot tell. They say the timber is of great use. I believe it doth not carry seed; but it is raised of layers, tips taken from the root, or by suckers. Mr Evelyn advises to raise them after this manner: Take, says he, truncheons of the boughs and arms of elms, cut the scantling of a man's arm, about an ell in length; these must be chopped on each side opposite, and laid into trenches about half a foot deep, covered about two or three fingers with good mould. The season for this work is the end of January, or early in February, if the frosts do not hinder. And, after the first year you may cut or saw the truncheons off, in as many places as you find cause, and as the shoots and rooted sprouts will direct, for transplantation. Another method he advises, is, lop a young elm, the lop being about three years growth. Do it in the latter end of March, when the sap begins to creep into the boughs, and the buds are ready to break out; cut the boughs into lengths of four feet slanting, leaving the knot where the bud seems to put forth in the middle. Interr these short pieces in trenches of three or four inches deep, and in good mould well troden, and they will infallibly procure you a crop; but, as I only tried these methods last spring, I cannot tell how they succeed; but I shall tell you

you afterwards, if I live. *N.B.* As this kind of elm is not raised in a seed-bed, it will be proper to have a nursery to set them in. This is a piece of ground trenched and made free from weeds and roots; into this set your young elms, thus raised, at a foot's distance every way; there let them stand, the ground being kept clean, for two years; and then they may be set for good. There are more kinds of elms in England, but I have not experience of them. Besides another kind, called the *Dutch elm*, that will grow upon a much coarser soil, than any I have named; I never saw any of them of the size of what is called a tree; mine are all young; I am told they never grow thirty feet high, and I am ignorant if the timber is of any use. It puts out numberless suckers, so that it spoils all grass-walks within the reach of their roots. Some use them for hedges; but, I think, both they and the *Scots elm* are unfit for that use, their leaves being too broad and disagreeably rough. One thing I had forgot, when I was writing of the oak, but I shall set it down here, as being necessary for all trees set out as I have advised from the seed-bed. That care should be taken, to keep the grafts and weeds from growing about the roots of the plants, lest they choke or strangle them; when they once come away heartily, neither can stop their growth. I go on to

S E C T. IV.

Of the Ash.

Which is raised from the seed commonly called the *Ashen-keys*. They are ripe in October. When gathered, they should be carried where the seed-bed is already prepared, and the earth pressed off with the back of the rake; the seed should be laid on this bed so as to cover it all, and then the earth must be drawn over the seed. I think the sooner this is done, after the seed is ripe, the better; but though the seed be thus sown, yet it will not begin to peep above ground till spring twelve-months after. I chuse to sow them thus, rather than be at the trouble of laying them in sand for a year, and then sowing them in a seed bed. After they appear, they should be let stand for two years in this bed, carefully weeded, and then set out for good, as I have said above; and the same care of keeping them clean, disbudding, and pruning, should be taken of them, as I have advised of other trees. It is hard to be distinct as to the foil that the ash delights to grow in; sometimes an ash is seen to thrive very well on a poor, wet, stiff foil, and within two yards of it, upon the same kind, the other ashes, are such bark-bound stunted things, that it is a shame

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to see them. All this makes me wonder why some, who have writ about woods, should lay it down as a rule in the planting of woods, that every third sett should be an ash. I am sure, that if I had done so in the grounds I have planted, I should have repented it long ere now. In my wilderness, and some other places, they thrive prodigiously ; yet I wish I had set fewer of them there ; for it is a tree that is so long of putting out its leaf, that it gives a winter look to the whole field, in spite of the verdure of the other trees, tho' when it puts out its leaves, they are of a cheerful green, and it carries them when most other trees shed theirs, tho' not always. It is a tree of great, almost general use ; I therefore encourage it in the strips of planting betwixt the inclosures, and what part of my woods I can get it to thrive in. They are not proper to be set very near corn-fields, the roots running within reach of the plow, and the leaves taint the grafts in autumn. This tree, if carefully managed, as I have directed, may be brought to a great height and largeness, and of value.

S E C T. V.

Of the Walnut.

This tree is only propagated by the nut. Some talk of different kinds ; but as what we get

are all from France, they seem all alike to me. This tree of all others (if possible) should never be removed, since it suffers much by it; but because of the vermin we are forced to manage it in every thing like the oak. The side-buds and branches of this tree should be carefully taken away, (and what I never can say enough against) forking should be prevented; for no tree is more apt to fork than this one, and none loses more of its value by doing so. Had we greater plenty of this useful and beautiful timber, the furniture of our houses, such as chairs, tables, bedsteads, &c. now made of beech, would be much more handsome, as well as durable, besides the great demand the cabinet-makers always have for it; I therefore wish it was more propagated.

S E C T. VI.

Of the Chesnut.

This tree thrives best when raised from the nut. We must treat it as the oak in all respects; but if it could be preserved from vermin, would do far better unremoved. It is very apt to put out suckers, and many side-branches, which ought to be taken carefully away; for it inclines much to spread. If this is not done, it will not be easy to get it to grow to a great height, which it will do if

care is taken of it. Why a late reverend author has placed the chesnut amongst the lesser kind of trees, I know not, since I have seen them very high, and proportionately large; and that there is the remains of one in England, that I think has been looked on as the greatest tree in it. Chesnut is the best underwood of any, the maple only excepted; it lives under the drop of another tree, and so is very excellent for coppice. It loves the same soil as the walnut doth, which thrives best upon a rich land. Some raise them by layers and suckers; but it is my fix'd opinion and practice, that it is best to raise all trees from the seed, if it carry any. Whether the chesnuts that are produced here will serve for seed, I cannot say; for tho' they are sometimes perfectly formed, grow hard, tho' small, ripe, and are very well tasted. What we get every year from Spain, France and Portugal, are so much fairer, that I always chused to set the foreigners. I know a Gentleman who cut down some he had planted himself, and wainscotted a room with them. To me it seemed very pretty, yellowish, with black veins. Mr Evelyn tells many uses made of them; but as I only write how trees are to be raised the best way, and to advise the shunning old errors, I shall not launch out to say all I know, far less to repeat what I have heard or read. There is another kind called the *horse chesnut*.

S E C T.

S E C T. VII.

Of the Horse Chestnut.

This tree is raised by the nut very like in
look to the other; but if tasted, is intolerably
bitter. I think it one of the most beautiful
trees that I ever saw. It has a clear, smooth,
shining bark; it naturally grows upright; has
(I think) the broadest leaf of any tree we
have, and comes earliest out in the spring; it
carries a fine flower, white for the most part,
tho' some have them more reddish. The flower
stands erect; these are succeeded by the nut;
but then this tree has the misfortune to be
very brittle, and cannot resist the wind; but
is often napt over when in its greatest beauty;
yet when cut hedgeways, (as at Highgate),
it stands the storm, and grows to a tolerable
height; but the hedging of trees (in my opini-
on) takes away much of the beauty they
have in their natural shapes; yet to surround
a kitchen garden, or when you would have
things warm and early, I know no such shel-
ter as a hedge of horse chestnut. I never heard
that the timber of it was of any use; yet as
it is a vast ornament about a place, I think it
should be propagated, but not in woods, as
the sweet chestnut.

SECT. VIII.

Of the Plane Tree.

This tree, I believe, is the same with what in England is called the *Sycamore*. By all I can observe, this appears to have been the favourite tree in all the north part of Britain; for there is no old seat, no gentleman's house, nor any place where trees are, but the Plane is the most numerous. It is raised from the keys as the ash; but with this difference, that when sown in November when ripe, they rise early the next spring, and when managed as I have advised that the other trees should be, the Plane will rise to a great height and largeness; they carry a fine leaf, and put out early in the Spring, one a fortnight before the other; but I see no other difference betwixt them. It makes a fine shade, and never yields to the wind, unless raised when young under the shelter of a wall, that makes it shoot so fast, that when it gets above it, the tenderness of the shoots makes it unable to resist the winds. It is shy as to the soil, but will thrive where the elm and ash do. For the uses of this tree, I refer you to Mr Evelyn, who will inform you, not only of this, but of every other tree. In the same house where one room is wainscotted with chesnut, there is another,

done

done with Plane; it looks very well; but I was told it was very hard to work; yet it takes the worm very soon, unless varnished on both sides: I believe it is of no great value, tho' some think otherwise; and I hear it has been lately discovered, that driven into the earth for posts to gates, it lasts, without rotting, longer than any tree yet tried: If this be true, and what Messrs Evelyn and Cook say, that in a park the deer will not touch it, there is no doubt it ought to be propagated, since it grows high, and great and straight, has a broad leaf, looks well in thickets, and resists the winds.

S E C T. IX.

Of the Horn-beam.

Writers recommend the raising this tree from layers or suckers; but I chuse to do it by the seed, tho' it lies as long before it peeps as the ash doth; and should be ordered the same way. It makes a pretty hedge in a wilderness, and I hear comes to be a large tree; but all I ever saw of them in this Country are but young; nay, I never saw a tall tree of this kind; for in Hertfordshire, where they are in great plenty, they are all, as far as I could observe, pollards; and I have seen them shooting out fresh branches from the head when

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the body of the tree was quite hollow, and only the shell left. I hear the timber is of use, but I have no kind of experience of it. I have many hedges of this plant, and have set out severals for trees; but whether I have mistaken the soil I have planted them on, or what is the matter, I cannot tell; but as yet they thrive, as I expected, in hedges, they keep feathered from the ground to a great height, and like the beech carry the withered leaves till the new ones in the spring thrust them off. This makes a hedge of Hornbeam a great shelter to any thing that is surrounded by it. If designed for a hedge, it should be neither pruned nor disbudded, but if for a tree, should be both, and never suffered to fork.

S E C T. X.

Of the Service.

I am told of many kinds of this tree; I have but one which has a dark green leaf, broad, white on the under side; it carries a cluster of white blossoms; they are succeeded by one of red berries, by which they are raised. Their colour makes a pretty variety when mixt with other trees; but whether it comes to be a large tree, or is of any value, I cannot tell; but I was once told there is one

kind

kind of Service that is as valuable as the monogeny. What kind it is, I am yet to learn.

S E C T. XI.

Of the Black Cherry.

This is called here the *Geen*, and is of two sorts; the fruit of the one is black, and the other red, both (if large) delicious, and are much improved by grafting. They rise to a great height, and take up large bodies; nor is it at all shy what soil it is set in. It has a shining bark, is in great beauty in the end of April and the beginning of May, when quite covered with the white blossoms, and in July when full of fruit, that it seldom fails to carry in great quantities. Moses Cook talks of one of a great height, and I very well believe him, yet it is very brittle, and soon broke by the wind. I am told the frames of the common rush-bottomed chairs, that come from Holland, are made of this tree. Be that as it will, it should be more encouraged than what it is, both for its beauty and fruit. I shall now mention a very beautiful tree in

S E C T.

S E C T. XII.

The Quick-Beam.

This tree is called in the country the *rowan* or *roddan-tree*; it has a smooth bark; the branches grow almost upright, so that it is difficult to prevent them from forking, yet may be done with care. It has a long narrow leaf, bears a fine cluster of white flowers in May, that shew very pretty, and the red fruit that hangs very long, gives it a rich look, and is a great relief to the black-birds and the thrushes. The tree is easily raised by the berries. Rub off the pulp and sow the seed in the seed-bed as directed of other seeds. Do the same with the *Sarvice* and the *black-cherry*; but the quickbeam lies as long below ground before it peeps as the ash; but I am not so positive as to the other two. I never saw a large tree of this kind but one, and it had been cut down, and sprung from the root in three stems. I have no doubt but it may (if taken care of) become high and great enough. Mr Evelyn tells its uses; but I shall mention one that he doth not. The bark sells at equal price with that of the oak. It thrives in almost any soil. I was told by a friend, that unless the earth is now and then stirred at the roots of these trees, that they

will grow bark-bound and unthriving ; but
these are older than mine ; but should it happen,
the cure is easy, since it is so beautiful a tree ;
and of such service to the singing birds, and fit
for tanning ; I think it ought to be propa-
gated. I shall in the next section recommend
a tree that I do not remember to have seen
in England, though I am told they have
them ; nor have I seen them mentioned by
any of their authors as a tree ; one indeed
speaks of it as a shrub.

S E C T. XIII.

The Laburnum, or Pease-cod Tree.

This tree is so called here. I shall first de-
scribe it, and then tell how it is to be raised.
It has a yellowish green bark, with leaves al-
most of the same colour, shaped like the tre-
foil. It puts out a flower that hangs down
like a bunch of grapes of a fine lemon-colour,
sometimes a foot long, made up of a great
many small flowers like the lilly, but different
in colour. The lilly-flower is erect, and the
laburnum hangs. I have seen so many flowers
upon an old tree of this kind, that it has been
all over bright lemon-colour ; after the flower,
comes small pea-cods, one where every little
flower was. These, when ripe, are threshed
and sown in a seed-bed, as I have told o-
ther

ther seeds are. After two years, they ought to be set out ; they are no ways shy as to the soil they are planted in, neither is much looking after required. The hares are so fond of them, that they will eat nothing else if they can get them, so that I set numbers of them that they may spare my other trees. I am surprized that any creature should eat them for the bark is most terribly bitter, and the seed is a strong vomit ; it has not been reckoned a tall tree, since it is very apt to fork though I doubt not, with care in pruning, but they may be brought to be tall enough. I have some that are as tall as the other trees that are of the same age. Could we get them to take a great body, they might be of great value ; for the timber is exceedingly hard and of an uncommon colour, *viz.* a bright yellow, vein'd with a blackish purple. When it once the size to be sawed into planks, would make incomparable tables, &c. To quickbeam and this tree when set alternately in a walk, has a very good effect. My cross venue is lined with them.

S E C T. XIV.

Of the Maple.

The maple is to be raised from seed, suckers, or layers. I chuse the first way. It best

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keys like the plane ; but they lie as long in the bed without sprouting as the ash, and should be managed in every thing like it. We have few large trees of this kind that I know of ; but I have seen huge ones in England. It is much valued by cabinet-makers and gun-smiths. It grows a beautiful tree ; but the dropping of it is so pernicious, that no other tree can live below it, though the maple itself will thrive under every thing, even the fir, which is the worst of all trees to grow under. It makes a pretty hedge in a wilderness, and changes the colour of its leaf twice at least every year. I have little experience of it myself ; but I shall have occasion to mention it afterwards, when I come to treat of fences. Mr Cock says it loves a dry ground or a bank most. Mr Evelyn is very eloquent in the praise of this tree, and even extravagant when he tells the value the antients put upon tables of this timber. He talks of different kinds, but I know but of one. I am intending to raise many of them. I proceed now to

S E C T. XV.

Of the Lime.

The lime, which is best when raised from the seed, though I could never raise one that

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way, by reason that I never knew it come to perfection here ; and I hear but seldom in England. I have often given commissions for it, but those I employed neglected them ; I have raised however a great many by layers. There are two kinds, one whose twigs are redish in winter, with a large round leaf ; I prefer it to the other with the green twigs, and the more pointed smaller leaf ; they are both to be raised the same way. This tree requires to be much pruned, to keep it from forking, yet it must be done with discretion ; for it is allowed to be thick in the head. The winds may harm it. It makes a fine hedge, either feathered from the root, and then they may be set at two feet distance, or set at ten, and trained up to what height you please, and then hedged above that either way. They are very beautiful. I have seen them twelve or fourteen feet high in the stem, and then hedged. There is an avenue of them at Zion-house, that, after a clear stem, are clipped into pyramids ; but I thought it made them look too formal, and constrained : Besides I think the natural shape of a lime-tree, with a little correction, much more ornamental ; and I believe this tree is of very little other use, though Mr Evelyn finds a great many.

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S E C T. XVI.

Of the Hazel.

Though I think this rather a bush than a tree, they are raised from the nuts, and are to be ordered like the other nuts; but as they never come to be trees, I have been at little care about them. They serve for under-wood, good for the binding up faggots, and is of special use for the sievier; but that doth not consume many. Some people like the nuts, which are of many kinds, as the common, the Spanish, the filbert, and the cobnut. Dry ground is recommended for them, though I am certain I have seen them grow upon a quite contrary soil. But now I have said so much on trees that grow upon good land, that I shall end this chapter, and begin

C H A P T E R II. *of Aquaticks.*

S E C T I O N I.

Of the Birch.

A N amphibious tree, that thrives upon a wet, dry, rich, poor, sandy, clayey, gravelly, or rocky soil. It carries a seed

that one of my people pretends to know how to manage, though hitherto his success has not been great; but as soon as I have seen his way succeed I shall add the receipt. The way I have taken has been, to beg leave of the Gentlemen who have woods to allow my people to gather the young birches, either suckers, or from the blown seed; but as these Gentlemen are not careful enough to keep the cattle from pasturing in their woods, the most part of the plants I could get were eat over; this obliged me to cut them close above the root when I set them; but as they now begin to come up in my own woods, where no cattle are allowed to come, I hope to be supplied that way, though the raising them from seed should misgive, (which I wish may not). The way I am to take is this, to draw them carefully either in the spring or autumn, and set them where they are to stand: After they have stood a year, I intend to cut them over in the spring. This will make them rise in tufts, and they may be easily reduced to one single stem, and so brought to a tree. The reason for which I wish they may do by the seed is, to have them in greater plenty; for as I said they thrive in every ground. I have seen them as high and great as most trees. It is excellent for coppice-wood: It smells sweetly after rain, and is pretty (I think) to look at. No tree is more asked after by the country people, both for their

their houses, ploughs, and all other utensils of husbandry ; and by tapping them in the spring, they extract a liquor, which, after fermentation, becomes a very spirituous, delicate and wholesome wine. But as I am only writing of the raising of trees, brewing is not my business ; I therefore refer you to Mr Evelyn, Mr Cook, and the transactions of the Royal Society, for receipts for making this wine. I have set many of this kind of tree, and if I live I'll plant many more of them, since I think it much more profitable than the tree that shall be next treated of, though much extolled.

S E C T. II.

Of the Alder.

For this tree I have laid out more money than for all the rest about this place ; for I got them from Holland, and I was not only imposed upon at first buying, but wanting skill myself, I had the misfortune to employ men to plant them that were ignorant. They set them too deep ; this made them fret at the tops, and die downwards, so that I was forced to cut them over ; yet, for all that, there are fewer (comparatively) thriving alders about this place, than of any other tree I have yet planted : However, I believe I

have more that are thriving than what I could get sold, if they were all fit for the ax; for there is no great demand for them. Yet it is a handsome tree, with a fine dark coloured green leaf, and neither the shade, nor the dropping of it, do any hurt to the grass. I know not the way of raising them, but I believe all I shall ever have occasion for I may get in my own grounds, as I gather the birch, amongst the older ones. Mr Evelyn tells many uses they are fit for. I shall name but two; the first is, the planting them on the banks of rivers, serves to keep them from being run away by the water; the roots running through the earth hinders the river from making breaches. The other use is, the branches cut off and faggoted laid in the bottoms of drains for carrying off water, whins or furze laid a-top of the alders, and then the earth laid above all makes the ground solid, so that the ploughs go as on firm ground. I have tried these drains with great success.

S E C T. III.

Of the Poplars.

We have few poplars of any size in this country that I know of; but having heard much of their height and greatness in other places,

places, I have got some of the kind I was told were the best. They hitherto prosper very well, and are easily raised from cuttings, as the willow; but as mine are but young, I can say but little about them; they have a whitish bark, and a yellowish green leaf; for the uses I refer you to Mr Evelyn.

S E C T. IV.

Of the Abele.

I wish I could as easily raise this tree; but I know no other way of doing it, than by the young plants that run from the roots of the older ones, or where there has been a nursery of them; for though they are taken up with all care, yet still others will rise there; or if a middle-aged abele is cut down, and the ground about the root wrought, and no cattle suffered to touch them, a nursery may be soon got. I think the tallest trees I ever saw were of this sort, and they carried up great bodies with them. No tree that I know runs up so quick as the abele, if it is planted in a well sheltered place; but if exposed, it yields terribly to the wind; it makes an agreeable variety mixed with trees of a deeper green, for both the bark and the leaf are the whitest of any we have. This tree was looked on in this country as of very little

little use; though an old Gentleman, (a great planter for his time) told me, that in a barn which he had resolved to roof with ash and elm, running short of trees, he put in some abele, which lasted so well, that when the other trees of the roof failed, and he had the barn to new roof, he left the abele standing, and renewed the others. But I hear they make use of them in England, saw them into planks for flooring and wainscotting, nay make solid steps for stairs with them; they are very white, but I should be afraid that they would easily dimple. They are used for ship-pumps, trays, &c. They will thrive upon spouty ground, nay will grow upon dead sand. I am grown fond of this tree, and that has made me say the more in its praise; and I do all I can to propagate them, since I expect they will do very well on the warren.

S E C T. V.

Of the *Aspin.*

Called here the *quaking ash*, for the continual trembling of its leaves. I had heard it so much praised both for beauty and profit, that I was at a great deal of pains to get some of them. In the first place, they were shy to take in my grounds; and when they did,

ver grew kindly; neither have I heard that they grow to the size of a tree, but decay before they can be of any value; then it is not easy (if they should once take) to get them rooted out; for they run through the whole ground, and poison it, so that I shall never advise my friend to plant what I throw out, whenever I meet with it, as a most pernicious weed.

S E C T. VI.

Of the Willow.

Innumerable are the kinds of this tree spoke of by authors; but I shall only write of them that I know are worth the propagating. The way of doing it is this. Set either in wrought ground, or by making holes, then to throw in the earth again, and, with a stake driven into the middle of this hole, make room for the willow to stand, and tread the earth firmly to it. The best I know to be raised to a tree, is what we call the *Huntington willow*; I have seen them of a vast height and greatness; and if they had not been allowed to put out large arms, had been of a much greater size every way; thus it will grow, if right managed, or it may be lopped, that is to say, have its head cut off, at 7, 8, 9, or 10 feet high, but to be sure to have it above the reach

reach of any cattle. Set, and managed thus, it will soon put out a large head; so that in four or five years at the farthest, these shoots may be cut; and, if they have had room to spread, from every two willows a cart load of wood may be had: Of what use this might be to those who live where coals or peats are dear, is worth consideration; though I never could prevail with any so situated to try a thing so much for their own interest, though it is a sweet burning feuel when dry; and willows of the height I have spoke of, may be set in the grounds proper for them, without any loss to the grazing of cattle. Willows may be set of these lengths in February or October without any heads; and if the side-buds are rubbed off till near the top, all the sap will run into it, and it will soon set out a head, but the rubbing must be continued for some years, till the bark grows so firm as not to put out any more. This is done at neither great expence nor with much trouble, and might be of advantage to every body who tries it. There is another kind of willow, but I know not its name, that is not altogether so swift a grower, to be managed the same way: This, some of my work-people say, is very little inferior to the ash, for fork, shovel, and spade handles, nay for some parts of carts. These two require and deserve a good soil. There is a third kind that is called here the *bay-willow*, from the resem-

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blance of the leaf to that of the sweet bay. There is another kind that grows wild in the woods, the bark of which, when in a small quantity mixed with the oak-bark, is sold with it; and is of use to the sieviers. There are many dwarfs amongst the willows; but these I have named may be called trees. In a particular manner, the two first, which I have seen in planks both thick and broad, and I know not but they may be of use. I was once persuaded to lay out too much money upon the trenching ground to plant willows for hoops, as a profitable scheme; but, after laying out that money, and the yearly charge of disbudding them, I found what I was offered for the hoops would not repay me: However, I think the very worst kind of willows are of some use or other. There are kinds fit for making of baskets; but as that trade is little followed in this country, the planting of this kind may be delayed. Before I end this chapter, I shall give you some necessary advices. In the *first* place, all four-footed beasts should be kept from your planted ground. I prevented all of a larger size but the hares, and, in spite of all I could do to destroy them, they have done me much harm. All that I have planted has been fenced except the warren, and there are two roads through it; but as nothing but men and horses with carriages have occasion to go that way, I have no cause to complain; but

but we kept a watchful eye over them at first.
2d^o, Though I have advised the planting out
of all trees when young, yet perhaps you may
have occasion to plant walks or views through
grass or corn fields. In that case your plants
must be taken out of the seed bed, and set in
a nursery, and removed every two years, till
they get many roots, and the trees are ac-
customed to be transplanted, and their bran-
ches are out of the reach of cattle. I own
this is both an expensive, and a troublesome
work, but it may in some cases be thought
unavoidable; yet I think such trees thus
planted ought to be staked for some years,
both to keep them from being shaken by the
winds, and till they are fixed enough to bear
the rubbing of cattle. 3t^o, If an oak or elm
is crooked, slit it in the ham up or down
quite through the bark, and it will grow
straight. 4t^o, Cut off the top or branch of
any tree I have yet named, if it is eat by
beast below where it is bit. I have said no
thing of the two kinds of *Platanus*, not ha-
ving any experience of either, neither of the
way of laying trees, or taking of slips with
little of the mother-root, nor of suckers; for
every author has a chapter upon these heads,
and every gardener knows the way. I shall
now begin

CHAPTER

CHAPTER III.

Of EVERGREENS.

SECTION I.

Of the Fir.

AS I believe I have raised and planted out more of this kind of tree than any one man ever did, so I have studied the best method of doing it, and am vain enough to believe I am as capable to give advice, in the management of this tree, as any person, though I differ in almost every article with all that have writ in English before me: I own, there is a letter printed in one of Mr Braley's monthly papers, that is very near right; but I even differ a little from him; I shall therefore trace the fir-tree (I mean the Scotch-fir) from the gathering of the seed till it is fit for the ax; and you may assure yourself, I shall say nothing, but what I know by long and great experience to be true. It is only to be raised by the seed: When I came to live here, there were but a very few fir-trees, and these I thought stood too near the house; for I do not think it a fit tree near a dwelling-house,

E

and

and therefore I cut them down ; I then was at great care to get the seed, and for some time bought it of Highlanders who bring it from the fir-woods, and sell it in the low country ; but these fellows, after gathering the cones, or, as we call them, the *clogs*, from laziness, lay them upon a kiln. This makes the cones open immediately, and brings out the seed ; at the same time so overdries it, that the seed cannot grow. Being thus disappointed, I wrote to a Gentleman who had a fine fir-wood ; he sent me a present of 13 horse load of cones ; but fearing it would be too late to get them all opened at the sun to be ready for sowing that year, a maid got the charge of some loads of them to lay before a fire to be opened there, with orders only to lay down a few at a time, and neither to lay them too long or too near. This she observed for some days, and we got out some very good seed that way ; but one day she laid down too great a heap, and wearying, went out to divert herself. A coal fell out of the fire, and when she returned, she saw all the heap in a flame. On this she run away and locked the door. By this means, I not only lost the rest of my fir-cones, but burned the furniture of one room, and with great difficulty got the house saved. After that I bought all my fir-seed for many years, from an honest old gardener, who, after my own trees came to carry seed, taught me the following

owing method, which I practise still. In January or February I get the cones gathered from the redest firs: This is easily known by their having been pruned. I keep them in a shade made on purpose till the sun has some force; I then make lay them out upon canvasses, while the sun shines, and have men near to carry them in when it threatens rain, and always at night. When any numbers of the cones are open, they are put into a wire sieve, and shaken till the seed falls out. This I do till the latter end of April; after that time the cones are carried out of the sun, and not exposed to it again till the hottest weather in July or August, and then they open fast. They are again shaken in the wire sieve, till all is got out. This seed got out in July I keep in old tea-canisters, or dried bladders, till next sowing time; but what is got out in the spring I sow immediately thus: I have beds prepared by trenching; and though not deep, made as free as possible from roots, stones, weeds, &c. and the earth made very fine; the soil to be of the middle sort, neither too rich, nor too poor, nor too wet, nor too dry, nor clay; the earth of the beds turned with the back of a rake, as our gardeners do when they are to sow carrots; but the fir-seed is to be sown much thicker. Then the earth is to be drawn over the seed till all is covered, and gently raked; a few days after, some more earth should be sifted upon the

bed. The next care is to preserve it from goldfinches and other small birds, who are very fond of it, and more when it peeps; for the young plants bring up the husk of the seed upon their tops. I once had frames the length and breadth of the beds covered with nets; but of late I have boys that watch the beds from sun-rising till he sets, till all the plants are come up thick as they ought to be; for though some authors say that five or six in a foot square is enough, I am never pleased if mine are not as thick as cresses. I say if the seed comes up thick, there will be no need of weeding them that year they are sown; but if any weeds appear, they must be pulled up with great care, lest with the weeds the young plants are likewise drawn. Before winter I make them throw on the beds a small quantity of chaff, or saw-dust, that has lain some time till the firey quality of it is wasted, or what is beat from flax when dressed. This preserves the ground from swelling with the frost, which if it doth, is apt to spew up the plants. In these beds they ought to stand two years, for example, from the latter end of April 1734, that the seed is sown, till the end of March 1736; from thence to the end of April thereafter, they ought to be raised for setting out, in the following manner. When you begin to take up your young plants, let there be standing ready a tub with earth and water mixed to the thickness of

palm.

palp. In this let the roots of the plants be dipt, and upon the roots of every five or six handfuls of plants, laid in a basket, lay a handful or two of this palp, to keep the roots from drying, which they are very apt to do either with the sun or the wind. One man can carry a great many this way. Formerly I had pits ready dug, and the earth with the grass-side undermost filled in, and then had the plants set with a dibble, taking care to set it no deeper than it stood in the seed-bed. And this is a necessary caution in the planting of all trees, since nothing can be more pernicious than deep setting; but I have now got a more expeditious way, and that is, to make one man go with a spade, and another with the basket. The first strikes his spade into the ground straight down, and presses it forwards and backwards, till the slit is wide enough to receive the root, which the man with the basket sets into the slit, and with his foot presses the slit together; but I must warn you, that this way will not succeed if the ground is rich or rank; for the grass will either strangle, or, by growing over, choke the plant. In that case pits must be dug as I have said, and the grafts and weeds taken from the roots for at least two years, and then if they prosper, I think they will be out of danger. Or take this method, which I have found out, and that is, where firs are designed to be planted where the land is rank,

cut up the turff with a paring spade, carrying it off the field, to be made up in dunghills, with lime and other manure. Then set the firs with the stroke of the spade as above directed. By this means the trees will be out of danger before the grass and the weeds can rise to hurt them. All who have writ of firs have not understood them, to say no worse. Some advise the putting them in nursery, there to stand some years. This occasions more trenching and more cleaning, takes more labour at the setting out, and more die this way than the way I have proposed. Some advise the letting them stand three years in the seed bed. I once did it, but they all died. The distance I set my firs at, when I plant oak, &c. amongst them, is never above five feet ; but when alone, I set them yet nearer, without any regularity ; for I only think them proper for thickets, or to shelter and bring up more valuable trees. And indeed it is most surprizing to see what progress oaks, &c. make even in the worst soil, by the warmth and protection of the firs ; but I am at great care lest a fir should hurt another better tree. This I prevent, by pruning every winter after the frost has set the sap at rest. This, in a great part, hinders their over-bleeding ; but, where both they and the other trees thrive, I cut down the firs to give more room to the others ; as this present year 1733, I have cut down in Binning-wood

2588 firs. I was once a great enemy to the pruning of firs, because what came from Norway had never met with that treatment ; but now, I think, when the side-branches are taken away when they are young, there can be no harm in it ; for the bark will soon grow over the wound, and so no knot can be without that part ; for a fir never puts out side-branches after they have been once cut off. When I began to prune, I found I had delayed too long ; for the branches were too great. This made the scars ugly ; so that firs ought to be pruned very young. What I propose is, that after it has been set out for good three years, to begin and cut away two stories or tires of branches. By this means, and every year cutting away one tire, you'll never have above three tire on a tree that is designed for timber ; yet I am not certain, but if they are planted at four feets distance, and no other trees amongst them, that it is as good not to touch them, but let them prune themselves ; which, by rubbing on one another, and want of air, they will do. Though I have heard it asserted that there is but one kind of the Scots fir, and what difference is seen in the wood when wrought, is only owing to the age of the tree, and the soil where it grew ; yet I am convinced it is otherwise, for this reason. When I cut down firs that were too near my house, there were people alive here who remembered when
my

my father bought the seed. It was all sown together in the seed-bed, removed to a nursery, and afterwards planted out the same day. These trees I cut down, and I saw some of them very white and spungy, others of them red and hard, though standing within a few yards of one another. This makes me gather my cones from the trees that have the reddest wood, as I said before. Here I cannot but say something of the authors who have writ about firs. They not only shew their want of skill, but of something else, since they pretend to instruct the world in things they know not the least of ; and are so far from correcting the errors of old authors, that they who have writ last, write the worst ; tho' that letter to Mr Bradley, signed John Edinburgh, might have taught them better. They advise the sowing five seeds in a foot square. I say, the thicker the better. They say, they should stand three years in the seed-bed ; I am sure two are sufficient. They are for removing them into a nursery ; the way I do is less expensive, and the trees thrive better. They likewise say firs will not prosper in a sandy soil ; now, I can show by some hundred thousands in my warren, that they thrive, though it is dead sand. How many kinds of fir there are, I cannot tell ; since I know not, if that kind that comes from Norway, be the same with ours ; but what we have from Sweden, seems to differ from both. We have

have the silver and the pitch-fir here, that thrive very well, managed like the common. I tried the great pine, but with very little success; they died, upon their being removed; but whether that was owing to our ignorance of the soil, and the way of managing them, I cannot say; but the pinester doth very well. People differ about the goodness of the silver and pitch fir-trees.

S E C T. II.

Of the Ever-green Oak and Cork Tree.

They are said to grow large, and to be used for ship-timber; but mine are all young, and I never saw either of the two large, but one ever-green oak, and there was a wall betwixt me and it.

S E C T. III.

Of the Cedar.

I am persuaded, could we get the cones of the cedar of Lebanon, that it would prosper as well as the common fir; for that of Bermudas all I ever saw of them were dwarfs, and seemed to be junipers.

S E C T.

S E C T. IV.

Of the Yew and Holly.

The yew and holly, when not dwarfed with formal clipping, arrives at a great stature, and value ; but as they require so many years to bring them to perfection, few plant them for trees, though I do, and I intend still to do so. Nay, I have pruned up all that I had in shapes, and hope to make them trees still. I do so with the holly too, since I think it a beautiful tree ; but it is now scarce to be met with, since the fashion of clipping them has prevailed so long ; but I hope will now be at an end ; yet I continue both it and the yew for hedges.

S E C T. V.

Of the Laurel or Cherry-Bay.

The laurel or cherry-bay I hope may be brought to a tree. I have young ones that I have pruned up for that end, and they give me great hopes of success, tho' only from layers ; but as I get enough of seed every year now, I fancy they'll grow taller. The seed of the laurel rises the first spring after sowing, but the yew and

and holly lie as long before they peep as the ash. The rest of the greens I shall only name, without giving a section to each.

The sweet bay is less than the laurel. Some authors say it will grow to a tree ; but they are often trained up in tubs like orange trees.

I shall say little of the *phylerca* and *alater-*
nus, one of which I have seen the height of
an orchard pear-tree.

I have none of the large box-tree. I have Laurustinusses here, but they are only bushes ; however I am pruning them up, to see what I can make of them. There are a few such large trees here ; but though it is not an evergreen, yet it is a pretty plant.

I say nothing of the two kinds of junipers ; for I like neither, far less the savine. I speak nothing of exotics or plants that need green-houses and stoves, being ignorant of them. I shall now make a very short chapter of the next.

CHAPTER

CHAPTER IV.

Of WILDERNESS.

AS this is only laid out for shade and ornament, nothing certain can be said about it, nor any rules given. Some have them large and some less. When they were introduced into this country, they were generally formed with a centre and straight walks from it, with the best views that could be found. These walks were for ordinary hedged, as were the serpentine walks that run through the whole, from one straight walk to another, and trees of different kinds set in the angles betwixt the hedges; but I hear that they are now weary of that way, and every one lays out his wilderness as he pleases. Were I to plant a new one, there should be nothing in it but evergreens, flowering-shrubs, and trees that carry fine blossoms, with a willow that has a bright lemon-coloured bark all winter. The evergreens have a cheerful look in the melancholy season of the year, and the flowering-trees make a fine variety in summer; but as all this depends upon the fancy of the owner, let every one do as he likes best. I shall conclude what I had to say of trees, by adding something

thing, (though I am afraid very imperfectly) about coppice.

C H A P. V.

Of Coppice.

I Have read many proposals for making this improvement, as by plowing the ground, and sowing all kinds of seeds promiscuously. I own that plowing, and fallowing, may be a good way; for the looser and the finer the land is made, the better. But I would, rather than sow the seeds, advise to have the trees raised in a seed-bed for two years; because some of the seeds lie so much longer in the ground before they rise than others; so that while they are cleaning and houghing about the plants that are come up, they tread down and destroy the plants that have not appeared. But the way I have proposed prevents that danger. Others advise a more costly way, by leaving four feet of solid ground the whole length of the field, and then digging up the next four feet for the same length, and to throw the earth out of this trench upon the four feet that were untouched. This will double the ground, and make the plants thrive the better; and they say the falling of the leaves will fill up these trenches, and the roots will run from

one bank to the other, but as I never tried either of these ways, I shall not pretend to say any thing positively. What coppice we have in this country, seems to be natural; but I have always disapproved of the method of cutting all down at a time; since, if some fine oak, or other good tree, were left at right distances at every felling, in a few fellings these trees so left might come to be timber, without doing any harm to the underwood; for as I have said, the maple, the sweet chesnut, the hazel, and the sycamore, grow under the drop of (almost) any tree; I think a coppice, thus ordered, a pretty thing; but as I at first said, that my experience on this subject was but small, I shall not trouble you with writing what I am not sure of.

And now, my dear child, I have made good my promise, and told you the methods I have taken to raise almost all the trees about this place. I hope I have been distinct enough in what I have said; since I have shunned all hard words or affected ornament of stile, and have told nothing but my own experience, of the truth of which I can get proof. I own what I have said of coppice is very lame; but as there are as many trees planted here as will supply the want of a coppice wood, 'tis the less matter. I am to add some more to what is above, viz. about fences, and then a short account of grass-seeds.

I shall hasten to them, and in the mean time assure you, that tho' I have differed very widely from all the authors that have hitherto treated of forrest-trees, yet I am right, since I have tried all I have recommended. What I had only by hearsay, I have set it down as such, and even there I have been very cautious; for I have told nothing but what I had from people whose veracity I cannot doubt. But now I shall hasten to

C H A P. VI.

Of Fences.

I Have tried different ways of making fences, of which I shall give you the following account. I made some with ditches four feet wide at top, drawing into one at bottom, and three feet deep, doing the like in the other side, six feet from the first, throwing the earth out of both to the ground betwixt them. There the hedge on each side was set, and the rest of the heap was set full of trees; but I found the cattle made shift to scramble up, and eat all the plants. I then made ditches after this way, I began the ditch and laid the first turf within half a foot of the ditch with the grass-side down; upon that I laid quicks or white-thorn at eighteen inches distance from other, having cut them so,

that about an inch of them lay beyond the turf. When this was done, another turf was raised, and laid upon its edge with the grasse-side outwards just upon the quicks, and laid on another row of quicks at the same distance, so as to point out betwixt the middle of the row below: then I raised another turf, and laid it above the second row of thorns, on its edge, with the grasse side outmost; on that I laid the third row of quicks just above the first row; then I threw the earth out of the ditch, the best upon the plants, and the rest behind them. I did so on the other side, but sometimes left 40, 50 or 60 feet betwixt the ditches, which I stuck full of trees, and called them strips of planting. I then tried another way. I drew two lines at nine feets distance, the length of a field, lifted the turf without the lines, and laying them edge-ways with the grasse-sides outwards, raised banks, filling in the earth in the middle betwixt the two rows of turf, till I raised it betwixt five and six feet high green on both sides, nine feet broad at bottom, drawn into three and a half at top. On this, hollowed a little, to keep in the moisture, I set hollys upright. It has long been a handsome and secure fence upon the road side; but dividing this field into six, I only made half banks, that is to say, they were only grasse on the side to the inclosure, and the earth that was thrown back was wrought in a border, and the

the hollys set, and behind the hedge was the strip of planting set, then a holly-hedge and a half-bank. But the most secure fence I have made yet, was the raising banks, as I have set down in the second place, but without quicks, and where it is raised to a sufficient height, face it up with dry stone. But this must be observed, that this stone-wall must lean but little upon the earth bank, lest the weight bring it down: Then let the earth be pared before the wall, and be thrown upon the earth-bank. This will make the field slope to the root of the wall, and let the surface earth (which is the best) be laid so, that the hedge, whether holly, or thorn, may be set on a border. This is the best fence I have yet tried, except stone and lime-walls, which are very expensive, and I am very unlucky, in having very little good stone here, and till I hit upon a good quarry, I am resolved, any more inclosures I shall make, to follow the advice of a skilful Gentleman, a friend of mine, to whom I wrote that I was going to make up my fences. He was living then on Windsor forest, and wrote to me what follows: 24th September 1732. "Since you tell me, that you are endeavouring to make your fences good, and as I am in a country, where, I believe, they are the best and strongest in England, and made and kept the cheapest; I shall tell you something of them. You know that over most

“ of England, they make great use of the
“ sloe or black thorn and common brambles.
“ I have long been of opinion, that a mix-
“ ture of them make the best fences; for
“ clipping the white thorn, as in a garden,
“ is an expence that farmers cannot be at,
“ and without that they will grow thin, so
“ that the sheep may get through, and the
“ greater cattle will soon follow them. Cut
“ regularly with sheers, is both expensive,
“ and their being kept low doth not warm
“ the ground so well as if high. They have
“ ditches as usual, and plant the hedge with
“ white thorn mixt with maple, crabs, hazel,
“ alders, oak, ash and elm; and the bank on
“ each side they ram full of black thorn,
“ brambles and common briar to keep it close,
“ that nothing can pass. I have seen a setting
“ dog run along the whole side of a field,
“ and forced at last to get out at a stile. It
“ is necessity makes them keep their fences
“ so strong, for they cannot use paleing but
“ for a gate, and must not disturb the
“ deer if once they get into an inclosure;
“ but see a herd of them destroy a coppice
“ wood, or a field of ripe corn before their
“ eyes, the inclosed lands having been stola
“ from the Forrest; and if they do not sub-
“ mit, the keepers will bring an action a-
“ gainst them, which will end in shewing a
“ title. I have walked in lanes a mile long
“ with a hedge on each hand, ten feet high,

“ so

" so close with brambles interwove, with
" crabs, black thorn, maple, &c. that no
" bird can get through. When they cut
" them as they do, tho' not so often, as in
" the country where their fences are only a-
" gainst horses and black cattle, they do not
"plash them, which weakens the root, but
" cut them a foot and a half above the top
" of the hedge; for what is on the banks
" they cut close; then they fix on dry thorn
" bushes a top to stand as high or higher than
" the stumps of the white thorn, crabs, &c.
" and hang upon the stumps. The bushes cover
" all the sides of the banks; and the roots of
" the stumps being strong, they throw out
" shoots of half a yard long the first year.
" The stuff upon the banks runs up upon
" the dry thorns, which have been laid on
" them as thick as in a seed bed, and in two
" years a stag will sooner take a brick wall;
" and the gate of an inclosure (if it is not
" stuck full of bushes) is the weakest part of
" the fence. The black thorn is best for
" this use; it is thicker and tougher, and
" lasts longer: A strong hedge, when cut,
" yields a great deal of money, besides pay-
" ing the charges. They make long faggots
" of the black thorn, five or six feet long.
" These they sell to the overseers of the high-
" ways, who lay them at the bottom, with
" stones and gravel over them. They are
" tough, and do not yield to the weight of
" the

“ the waggons, and last many years, without
“ rotting. The large white thorn, ma-
“ ple, crabs, &c. make good faggots, and
“ the smallest of all for brush fire-wood, the
“ common people having no coal but from
“ London. It is not to be believed how
“ thick their hedge-row trees are, and once
“ planting doth for ever. When they cut
“ their hedges, which they do sometimes
“ both for profit and to scour their ditches,
“ they prune up all the young trees. The
“ elm you know comes from suckers; the
“ oak, ash, &c. from seeds, which drops in-
“ to, and is so sheltered by the hedge, and
“ gets up through it, so that one may see
“ the finest young trees pruned up a man’s
“ height above what is on the dyke. When
“ a hedge has been lately cut, and these trees
“ stand at three or four feet distance all along
“ the dyke, the elms, and sometimes the ash-
“ es, that are well grown trees, but not what
“ is called timber, they generally prune very
“ high, for sake of the burn-wood that is
“ got off, and to give air to the rest that are
“ lower of all sizes. They seldom prune up
“ the oaks so high, because their branches
“ pay well in bark, and otherwise, when large.
“ In short, in the inclosed parts of this coun-
“ try, it is common to have some hundred
“ pounds worth of timber-trees, upon a hun-
“ dred pounds estate *per annum*. They cut
“ all the timber-trees round an inclosure at

“ once,

" once, or pick them out every year; for
" there is a succession rising, that every year
" the timber yields as much as the land.
" They have several advantages in the thick-
" ness of their hedge-row trees, it makes the
" fence the stronger, especially when new
" cut over, for then it strengthens the dry
" hedge, and a stag will hardly venture to
" brush thro' trees within three or four feet of
" one another. By this I see the mistake of
" thinking the putting so many plants in a
" bank between two ditches hinders their
" growth; being so covered, keeps out the
" cold and the sun, and keeps in the moisture;
" and it is plain, where the bank is thickest,
" every thing grows best. The crab-apples
" they make verjuice of, and the farmers
" sometimes mix them with their apples for
" cydar; for there is scarce a cottage with-
" out a little orchard. The alder berries are
" of great use; the maple grows fast and un-
" der the drop of other trees, is a strong
" hedge, makes good stakes and burn-wood,
" and the bramble mix'd with it, rises high
" on it, and on the hazel and philbert, both
" which, when cut down, run up presently,
" and are thicken'd by the other things I
" have named. The young trees are left,
" when the hedges are cut, from four to ten
" feet high above the stumps of the hedge;
" and in between thirty and forty years the
" elms are fit for many uses, particularly for
" water-

" water-pipes. The use of the ash at the
" same age is known every where. The oak
" requires double the time, but answers well,
" when timber. I managed my hedges at—
" in the same manner, and had as much bil-
" leting from pruning the hedge-rows and
" the pollards, as served my house in fire:
" Where I burnt wood, the long faggots
" served my oven, and I sometimes sold those
" that were over. I kept a rotation by
" which I had and ever might have had e-
" nough in the few fields I rented for my
" own use. In seven years, such a hedge
" may be cut; but for deer they are longer.
" I have narrowly observed fields, where the
" old trees, by the care of the proprietors,
" were come to timber, where they cut every
" year timber to a greater value, than what
" the field yielded, nay almost double. I
" have computed upon the hedge round a
" small field of four or five acres, let for as
" many pounds, above a hundred pounds
" worth of timber-trees, and a succession of
" different sizes, that with care may yield as
" much more every thirty years; so that a
" man really has thirty years purchase for his
" land from the timber upon it every thirty
" years, and the yearly rent of his land to
" the bargain, without any expence but what
" is at first planting. Some weed them five
" or ten pounds worth, more or less, as he
" has occasion for money; some a whole or

" two

" two sides of an inclosure at once; others
" cut all the timber-trees in one year. I
" shall add something I have learned since,
" for the better understanding what is above.
" They generally plant one row of white-
" thorn upon the top of the bank, but they
" ram both sides of the bank with sets of black
" thorn, &c. as I have already said, and co-
" ver the bank with a dry hedge, made fast
" to stakes, and hanging over the face of the
" bank, which preserves the young setts, and
" also the hedge a-top, till all gets strength,
" much as they do when cut over. By the
" time the dry hedge is rotten, the hedge a-
" top is pretty high, and that upon the banks
" strong, and the brambles run along all o-
" ver the banks about the setts of the black
" thorn and the briar, which run up among
" and are protected by the dry hedges. This
" is a work once for all; for they give them-
" selves little more trouble about it, since
" beauty is not their busines, but an useful
" fence at a small expence; for such a one re-
" quires no more trouble till they come to
" cut it for the sake of the wood. What
" they take off doth much more than pay
" for their labour of cutting, scouring the
" ditch, and making good the banks. If
" there are any places too thin, they first cut
" all down with hedge-bills, tie up what is
" designed for fire-wood; when this is done,
" and they have left what will serve for dry
" hedge,

" hedge, they scour the ditch; and as this
" is done in winter, the stuff in the ditch is
" moist; part of it they throw amongst the
" roots upon the top where the white thorns
" are new cut, and the trees standing;
" and part of it they throw upon the new
" cut plants on the face of the bank, and bat-
" ter it with the back of a spade, by which
" the bank is kept up in height; and what
" may have crumbled down, is all made up
" out of the ditch. What is more, they
" throw out to the inclosure-side, and is at
" leisure carted away for making dung-hills,
" mix'd with other manure; then they pot
" on the dry hedge, and the roots of the stuff
" upon the banks run up though the earth
" (which has been laid up, and beat upon the
" face of the bank with the back of the
" spade) as thick as in a seed-bed. They
" let it alone, and grow what can grow, and
" no weeds or grass can hurt them, for they
" presently choak them, as they do what rises
" of their own kind more than can stand;
" and if any are wanted for gaps, they may
" be had here. They at first plant (as I
" have already said) a great many oak, ash
" and elms, in the hedge-row a-top, and they
" very seldom need to be supplied; for the
" seed falling, send up enough, and when the
" hedge is cut, they prune up as many as
" they please, and cut the rest in common
" with the hedge, I mean the white thorns

" on

"on the top. For making this a right fence, I shall tell you my notion; make a double ditch and a bank betwixt them, as I shall shew by a draught to be annexed; the roots of an old white thorn-hedge will do better than young ones, not only from their having got strength; but, as with the hedge-row trees, are to be planted as above, and mix maple and cuttings of alder, two or more of the first for one of the last. The face of the bank I would have ram'd full of black thorns and brambles, mix'd with some common brier, double of the two first named to one of the last; for the brier is by much the least useful of the three, and I do not think a few of the barberries amiss; and in the hedge-row a-top a few crabs. You know how valuable verjuice is. The cutting of an old white thorn hedge (if a black one, which is better, is not to be had) will (if it is strong) make the dry hedge, pinned all over the faces of the banks, and if not carried off, may last till the black thorn, &c. come up through them; and should they fall off, new ones must be pinned on again, in the winter, when the leaves are off; and they will last longer if cut after frost; but if they come off in the summer, when cattle are in the field, they must be supplied immediately to prevent the cattle eating the young shoots too close, before the roots have got strength.

" Possibly the cattle may crop them after-
" wards, when the shoots of the plants upon
" the banks get through the dry fence; but
" the roots will have got strength, and the
" dead hedge will not let them bite too close;
" so that they will push out strong the fol-
" lowing years, tho' topped a little. When
" an old hedge, and the banks are cut, and
" the ditch scoured, the roots being strong,
" all runs up fast; but at first planting, it re-
" quires more care, as well as time. In the
" next page you have the draught of the dou-
" ble ditch, and the bank."

This is what I had from this Gentleman; and now I think I have set down an account of the different kinds of fences I have made; and this last one (though I have not tried it) appears to be so good a one, that I am preparing, by getting of the seed necessary, to make it; and, if I live, shall try it. Without right fences, one cannot be sure of preserving his planting, his corn or grass, from being destroyed. As I have said nothing of the raising the thorn, white or black, I shall only add, that the first is raised by the seed called the haw, the other by the sloe, sown in trenched ground, as they are gathered and lie without peeping above ground till the second spring after sowing. I shall now in very short manner say something of

GRASS-SEEDS.

A Very great improvement, where, after corn, it is a great many years before the ground swards, and many more before it can produce hay or tolerable pasture. It was new in this country, except a little broad clover in some gardens, till I fell heartily to work. I had some English people who taught my servants. The broad clover has been long in high esteem in England ; it ought to be sown in good land ; the finer the ground is made for this, and all grass-seed, the better ; it is commonly sown above barley, and harrowed in with it. Twenty pounds was the quantity of seed that I sowed on a Scots acre, which is a fifth larger than in England. I own some of late sow more ; but I think I sowed enough. I have seen it thrive so well, that, after the barley has been cut, the clover was mown, and given green to cattle. The next year, (if the weather was seasonable) it was cut in the end of May for hay. I shall say nothing about the making of hay, every day-labourer now knowing that. After this crop is taken off, no beast should be allowed to touch the field, and the clover will rise much thicker than it did before ; when it is fully in the flower, it may be again cut for G 2 hay ;

hay ; and, by sparing it a week or two, will yield good pasturage, till wet weather ; and cattle should be taken off, lest they poach the ground. Indeed I most commonly kept the second crop for feed, which will be ripe in a month after it is full in the flower. I own the hay of this crop is not of great value, yet black cattle will eat it, especially if it is boiled ; but, by threshing, cleansing the seed, and a certain way of putting it through the mill, the seed is got out clean from the husk, and is made fit for sowing. Clover, in proper good ground, may yield one crop of hay, another for feed, and good pasture, in one year two crops of hay and pasturage for two more; but then it wears out of the ground; for which reason, some sow twelve pounds of clover, and three bushels of rye-grass seed on an acre. By this way the seed of neither is got, the one being so much sooner ripe than the other, and but one crop of hay; but then it will be a very valuable one, and it will hold for many years, especially if, instead of hay, it is sometimes pastured; nor will this either green, or in hay, endanger horses, as they say clover doth. When rye-grass is sown without clover above barley, four bushels is the least that ought to be sown in a Scots acre. If the land is in good heart, it ought to be, it will prosper exceedingly, and the trefoil come up thick amongst it. have sown the trefoil-nonsuch, or hop clover

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by itself, in vain ; but it always comes with rye-grass, where the ground is in order. There is a small clover with a white flower much in request ; it is the finest pasture ; but except sown with rye-grass, doth not make hay ; yet cut green, cows feed on it greedily. I have tried St Foin, but with little success, and La Lucern with worse ; but that may be our want of skill. I have great experience in clover and rye-grass, and therefore dare recommend them ; but if some sow them upon very poor and wore-out grounds, where nothing should be sown, they are to blame ; but if you will observe the grounds here, I hope you'll not be discouraged. I have sown broad clover alone in the spring with great success, and rye-grass in August, and in September, without any corn.

And now, my dear child, I have kept my promise with you, and told all that I thought necessary for you to know upon these heads. Whenever I learn any more of what may be for your pleasure or profit, you may lay your account with being informed.

TYNNINGHAM,
22d DEC. 1733.

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MEMORIAL

ON

Preferving and Repairing Forests.

By M. DE BUFFON,
of the Royal Academy of *Paris*.

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Preferving and Repairing Forests.

WOOD, which was formerly very common, is now scarce sufficient to answer the most necessary purposes ; and we are threatened with absolute want of it in time to come. It would be a real loss to the State to be obliged to have recourse to our neighbours, in order to supply ourselves at a vast expence, with what our own industry, and a very small œconomy, might furnish us : But it is necessary to set about it in time, we must begin forthwith ; for if our indolence lasts, and if our eager desire to enjoy continues to increase our indifference for posterity ; in fine, if the police of the woods is not reformed, it is to be feared that the forests, that noblest part of the demesnes of our Kings, will become uncultivated lands ; and trees for timber, in which a part of the maritime

maritime strength of the state consists, will be found exhausted and destroyed, without any near hopes of being restored.

Those persons themselves who have the charge of the preservation of the woods, complain of their falling to decay ; but it is not enough to complain of an evil which is already felt, and which can only increase with time, the remedy must be sought out ; and it is the duty of every good citizen to make public the experiments and observations which he may have made on the subject. Such has ever been the principal object of the Academy ; the public benefit is the scope of its labours. These considerations engaged M. de Reaumur in 1721, to give us some excellent remarks on the condition of the woods in the kingdom. He lays down incontestable facts, he gives the best views of things, and points out experiments which will do honour to the executors of them. Incited by the same motives, and finding woods a subject within my reach, I have observed them with particular attention ; and in fine, encouraged by the Count de Maurepas's commands, I have, for seven or eight years past, made several experiments on it. Views of private interest, as much as the curiosity of a natural philosopher, led me to have my copse woods managed under my own eyes. I made nurseries of forest trees, I sowed and planted large districts with wood ; and

and having made all these trials in great, I am able to account for the little success of many methods, which answered in small, and were recommended by authors on agriculture. It is with this as with all other arts ; the model which succeeds best in small, often cannot be executed in great. All our schemes concerning woods should be reduced to endeavour to preserve those which we have remaining, and to repair a part of those which are destroyed. Let us begin with examining the methods of preserving ; after which we shall come to those of repairing. All the trees for timber in the kingdom consists in the forests belonging to his Majesty, in the reservations of the Ecclesiasticks and Mortmain, and lastly, in the standards, which law requires to be left in all woods.

It is known already, by long experience, that the wood of standards is not of a good quality ; and that besides, these standards hurt the underwood. I have very often observed the effects of the spring-frost in two copse-woods that lay contiguous to one another. In the one all the standards of four successive cuttings had been preserved ; in the other they had only left the standards of the last cutting. I have known the frost so greatly prejudicial to the underwood, overburdened with standards, that the other copse has outgrown it by near five years in twelve. They were set in the same manner ; I sound-
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ed the soil in different places, it was alike; so I can only attribute this difference to the shade, and the moisture which the standards throw on the underwood, and to the obstacle which they formed to the drying up of this moisture, by interrupting the influence of the wind and sun.

The trees which shoot forth vigorously into wood rarely produce much fruit. The standards are loaded with a great quantity of acorns, and thereby declare their weakness. One would imagine that these acorns should stock again and fill the woods; but this comes to a very small affair: For of several millions of these seeds, which fall at the foot of those trees, we scarce see some hundreds rise; and this small number is soon choked by the continual shade and want of air, or suppressed by the dropping of the tree, and by the frost which is always sharpest near the surface of the earth, or lastly, destroyed by the obstacles which these young plants meet with in a soil replete with a multitude of roots and weeds of all kinds. 'Tis true some seedlings are to be found in copses; these trees come from seed, for the oak neither multiplies by suckers, nor shoots out from the root, but the seedlings are ordinarily in the thin places of the woods, at a distance from the big standards, and are owing to the field mice, or the birds, who, when transporting the acorns, drop a great number of them. I have fallen

on

on a way to turn to good account those seeds which the birds let fall. In a field, which for three or four years had remained uncultivated, I had observed that several small oaks had appeared on a sudden around some little bushes which were in it, at a great distance from one another; I soon discovered with my own eyes, that this plantation belonged to some jays, who, on coming out of the woods, went habitually to place themselves on these bushes to eat their acorns, and let fall the greatest part of them, which they never gave themselves the trouble to gather up. In a piece of ground which I planted afterwards, I took care to put some little bushes; the birds have taken possession of them; and have adorned all the environs with a great number of young oaks.

It appears that the decay of the woods, must have been begun to be perceived long ago, seeing that formerly our Kings gave orders for their preservation. The most useful of these orders, is that which establishes, in the woods of Ecclesiastics and Mortmains, the reservation of the fourth part for the growth of high trees; it is ancient, and was given for the first time in 1573, confirmed in 1597, and nevertheless remained without being put into execution till the year 1669. It is to be wished, that we may not grow remiss in this respect: These reservations are a fund of a real benefit to the State, a benefit too of a good

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kind, for they are not subject to the defects of the witters. There has been nothing better contrived, and we should have felt their good advantages, if hitherto credit rather than necessity had not disposed of them. This abuse would be prevented by suppressing the arbitrary use of permissions, and establishing a fixed time for cutting the reserved trees. This time should be longer or shorter, according to the quality of the soil, or rather according to the depth of the staple; for an attention to this is absolutely necessary. The cuttings might be regulated at fifty years, in a soil two feet and a half deep, at seventy in a soil three feet and a half, and at an hundred years in a soil four feet and a half deep and upwards. I give these terms after observations which I made by means of an Auger five feet high, with which I sounded a number of soils, where I examined at the same time the height, bulk and age of the trees; it will be found pretty just for strong and clayey, tough lands. In light and sandy soils the terms of cutting might be fixed at forty, sixty, and eighty years. To wait longer would be attended with loss, and it would be infinitely better to keep wood for service in magazines, than to leave it standing in the Forests, where it cannot fail to decay after a certain age.

In some maritime provinces of the kingdom, as in Britanny near Ancenis, there are com-

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mons which have never been cultivated, and though they are not of the nature of woods, are covered with a number of useful plants, such as ferns, broom and heath; but at the same time are planted with a great number of oaks that stand by themselves. These trees being often spoiled by the browsing of cattle, do not rise to any height; they are crooked and twisted, and have a bad shape, but are nevertheless very useful; for they may furnish a great number of crooked pieces proper for the navy, and for this reason, they are worth preserving: Yet these kinds of natural plantations are wasted daily; the proprietors either give, or sell to the country people, the liberty of cutting in these commons; and it is to be feared that these magazines of crooked timber will be soon exhausted. This would be a considerable loss; for crooked timber of a good quality, as these are of which I am speaking, are very rare. I have studied the means of making timber crooked, and I have begun some experiments on it, which will probably succeed; and which I shall relate in a few words. In a copse I made the stems of several young trees be cut at different heights, viz. at 2, 4, 6, 8, 10 and 12 feet from the ground; and four years after, I cut the top of the young branches which these cropped trees have produced. The shape of these trees became so irregular by this double operation, that it is impossible to describe it; and I am

H 2 persuaded

persuaded, that they will some time or other furnish crooked wood. This method of crooking wood would be much simpler, and a great deal more easily practised than that of loading the head of the young trees with a weight, or tying them down by a cord, as some have proposed.

All who are any ways acquainted with the nature of woods are sensible, that frost in the spring is the ruin of the copses. In the low places, and in the little dales, it continually suppresses the young shoots, and hinders the wood from rising; in a word, it does as great an injury to woods as to all the other productions of the earth; and if this injury has been less known and less felt, it is because the enjoying of a copse being remote, the proprietor gives less attention to it, and is the more easily comforted for his loss, which however is not the less real, since it puts his revenue many years back. I have endeavoured to prevent, as much as possible, the bad effects of frost, by studying the manner by which it operates; and I have made experiments on this subject, by which I have learned that the frost has a more violent effect on trees of a southern situation than on those of a northern; that it destroys every thing sheltered from the wind, while it spares every thing in the places where it can blow freely. This observation, which is certain, furnishes a method of preserving from frost some places of the copse,

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at least during the two or three first years, which is the critical time, and in which it attacks them with the most advantage. This method consists in observing, when you are cutting them, to begin with the North side ; it is easy to oblige the timber-merchants to this, by making it a clause of their bargain, and I have already found very much good in having taken this precaution with regard to my own copses.

A head of a family, a settled man, who finds himself proprietor of a small quantity of copse-wood, begins with getting them surveyed, bounded, divided, and cut at regular times; he imagines that this is the highest pitch of oeconomy ; every year he sells the same number of *arpents*,* by which means his woods become an annual revenue. He is pleased with this rule, and it is this appearance of order which puts him in conceit with set times of cutting ; yet this is very far from being the method of drawing all the possible advantage from his copses. These regular cuttings are only proper for those who have lands at a distance which they cannot visit. The regular cutting down of their wood is a kind of farm ; they count on the produce, and receive it without having given themselves any trouble about it. This must be the case with a great number of people ; but as for

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* The word in the original is *arpent*, which is 100 perches square, 18 feet each.

those who constantly reside in the country, or even for those who only go to spend a certain time in it every year, it is easy for them to order the cutting of their copse-wood to much better purpose. In general it may be taken for a truth, that in good soils they will gain by waiting; and in soils which have no bottom they should be cut very young. But it were much to be wished, that this rule could be given with precision, and that the age at which copses should be cut could be exactly ascertained; this age is that at which the growth of the timber begins to diminish. In the first years, the wood grows more and more; that is to say, the production of the second year is more considerable than that of the first, the increase of the third year is greater than that of the second; thus the increase of the wood augments till a certain age, after which it diminishes. It is this point, this *maximum* or precise time which must be taken to draw from one's copse all the advantage and profit possible. But how shall we discover it? how be certain of this instant? Nothing but experiments made, by the great, experiments long and laborious, experiments such as M. de Reaumur has pointed out, can inform us of the age at which woods begin to grow from less to less. These experiments consist in cutting and weighing every year the produce of some *arpents* of wood, to compare the annual increase, and discover at the end

of several years, the age at which it begins to diminish. Although these experiments appear to be above the power of a private person, I have already had the courage at least to undertake them ; and I hope that in less than ten years I shall be able to give account of them. This long term ought not to frighten others, since it has not been able to discourage me.

I have made many other remarks on the preservation of woods, and on the alterations which should be made in the regulations of forests, which I suppress, as having no relation to physical subjects : But I must not pass over in silence the method I have found out to increase the strength and solidity of timber-trees, which I communicated lately to the Academy. Nothing is more simple ; for there is no more to be done but to bark the trees, and leave them so, to dry and die away upon foot, before you cut them. The white wood by this operation becomes as hard as the heart of an oak, it augments considerably in strength and thickness, as I have been confirmed in by a great number of experiments, and the stumps of these trees which have been peeled and dried standing, do not cease to shoot again and produce new suckers ; so that there is not the least inconvenience in establishing this practice, which by augmenting the strength and last of timber-trees, must diminish the consumpt of them, and consequently

sequently ought to be placed among the number of the methods of preserving woods. Let us come now to those which should be employed for repairing them.

This is not a less important object than the former. How many useless lands, heaths, and commons absolutely barren, are there in this kingdom? Britanny, Poitou, Guyenne, Burgundy, Champain, and several other provinces, contain but too many of these useless grounds; what advantage would it be to the state if they could be rendered valuable? The most of these grounds were formerly in the nature of woods, as I have observed in many of those desert districts, where some old logs are still to be found almost quite rotten. It is to be believed that the woods of these grounds have been wasted by degrees, as the commons are wasted at present, and that in process of time they have been altogether dispeñished; we may therefore reasonably hope to repair what we have destroyed. We have no regret to see naked rocks, and mountains covered with ice producing nothing; but how can we accustom ourselves to suffer good lands to ly uncultivated, and whole countries to be lost to the State even in the midst of the best provinces of the kingdom. I say good lands, because I have seen some, and I have made them be cultivated which were not only of a quality fit to produce good wood, but even grain of all kinds. All that is necessary then

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would be to sow or plant these grounds; but it would be proper that this could be done at a small expence, which is a matter of some difficulty, as will appear by the particulars I am going to relate.

As I was desirous of being instructed thoroughly in the method of sowing and planting woods, after I had read the little which our authors on agriculture say on the subject, I adhered to some English authors, as Evelyn, Miller, &c. who appeared to me to be more knowing in the matter, and to speak from experience. I was willing at first to follow their methods in every point, and I planted and sowed woods after their way; but it was not long before I perceived, that that was a ruinous method, and that by following their directions the woods would have cost me ten times more than their value, before they had come to age. I then discovered that all their experiments had been made in smalls; in gardens, nurseries, or at most in some inclosures, where they could dress and take care of the young trees; but this is not what is wanted when we would plant woods. It is with great difficulty we resolve to be at the first necessary expences, how much then should we grudge all the rest, such as cultivating and keeping up, which of themselves become immense, when you plant large districts. I was therefore obliged to give up with these authors and their methods, and to get

get instruction by other means. I have tried a great number of different ways, the most of which, I own, have been unsuccessful; but they have informed me of facts at least, and have put me on the way of succeeding.

I had all the conveniences for the work that could be wished, soils of all kinds, cultivated and uncultivated, a great number of copse-woods, and nurseries of forest-trees, where I found all the young plants which I had occasion for. In fine, I began with attempting to throw into the nature of wood a space of ground of eighty *arpents*, twenty of which were moor, and sixty of arable lands, producing every year wheat and other grain, even in pretty great abundance. As my ground was naturally divided into two parts, almost equal, by a hedge of copse-wood; as one of the halves was of a very smooth level, and that the earth appeared to me to be everywhere of the same quality, though of a pretty unequal depth, I thought I could take advantage of these circumstances to begin an experiment, the result of which is at a very great distance; but it will be very useful. It is to know what difference inequality of depth of soil produces on a wood in the same ground, in order to determine, more exactly than I have hitherto done, at what age full grown trees ought to be cut down. Although I began very young, I do not hope to be able to satisfy myself fully in this respect, even supposing

I should live very long ; but I shall at least have the pleasure of observing something new every year, and why not leave to posterity experiments which you have begun ? I have then made my ground be divided into quarters of an *arpent*, and at every angle I made the depth be sounded with my *auger*. I set down on a draught all the points where I sounded, with a note of the depth of the ground, and quality of the stone which was below, samples of which the *auger* always brought up ; and in this manner I have the plan of the superficies and bottom of my plantation, a plan which it will be easy to compare, some time, with the produce.

After this preliminary operation, I divided my ground into several districts, which I made to be laboured differently. In one, I gave three ploughings, in another two, in a third one ploughing only. In others I made acorns be planted, with the dibble, without ploughing ; in others I simply made acorns be thrown, or scattered in the grass with the hand ; in some I planted little trees which I drew from my woods ; in others I sowed and planted trees of the same species, drawn from nurseries, some in the spring and others in autumn ; some at one inch deep, some at six ; in others I sowed acorns which I had first steeped in different liquors, such as pure water, the lees of wine, water which had drained from a dunghill, and in salt-water. Lastly, in several districts I sowed acorns along

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long with oats ; in several others I sowed some which I had first made sprout in earth. I shall relate in a few words the result of all these trials, and of many others which I suppress here, not to render this enunciation too tedious.

The nature of the soil, where I made these trials, appeared to me entirely alike through the whole extent of it. It is a strong tough earth, a very little mixed with clay, keeping water a long time and drying with a great deal of difficulty, forming by the frost and drought a kind of crust, with many little clefs in the surface, producing naturally a great deal of wall-wort in the places which are cultivated, and junipers in the places which are not, and surrounded on all sides with wood which grows finely. I sowed carefully all the acorns one by one, and at a foot's distance from one another ; so that about twelve measures, or Paris bushels, were bestowed on every *arpent*. I think it necessary to mention these facts, for the forming a better judgment of those which are to follow.

The year after I observed with great attention the condition of my plantation ; and I discovered that in the district where I expected most, and which I had made be ploughed thrice, and sown before winter, the greatest part of the acorns had not risen ; the winter-rains had so beaten and caked the earth,

earth, that they had not been able to pierce through ; the small number of those which had been able to find a passage, did not appear till very late, about the end of June : They were weak and slender, their leaf was yellowish and languishing ; and they were at so great a distance from one another, the district was so ill filled, that I had some regret for the pains it had cost me. The district which had been twice plowed, and which had likewise been sowed before winter, was pretty much like the first, however there was a greater number of young oaks; because the earth being less divided by the plough, the rain had not been able to batter it so much as that of the first district. The third which had only one plowing, was for the same reason a little better stocked than the second, but still it was so bad that more than three fourths of my acorns had also failed. This trial let me know, that, in strong soils mixed with clay, we should not plow and sow before winter ; I was entirely convinced of this, when I cast my eyes on the other districts. Those which I had plowed and sowed in the spring were much better furnished ; but what surprised me was, that the places where I had planted the acorn with the dibble, without any preceding culture, were considerably better stocked than the rest ; those even where we had only hid the acorn under the grafts were pretty well furnished, tho' the field-mice,

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wood-pigeons, and other animals had carried off a great number of them. The districts, where the acorns had been sown six inches deep, were much worse furnished than those where they had been sown one or two inches deep. In a little district where I had sown some a foot deep, there did not one appear; although in another place where I had put some, nine inches, several had risen. Those which had been steeped for eight days in lees of wine, and in the drainings of a dunghill, came out of the ground sooner than the rest. Almost all the trees, big and small, which I had taken out of my copses, perished the first or second year, whilst those I had taken out of my nurseries almost all succeeded. But what gave me most satisfaction, was the district where I had planted, in the spring, acorns which I had first made burgeon in earth, hardly any of them failed; 'tis true they rose later than the rest, which I attribute to the breaking of many of their radicles, in transporting them thus full sprouted. The following years produced no change in what appeared the first year. The young oaks of the district that had been plowed thrice, have remained always a little behind the rest, and are still weaker than those of the other districts. Thus, I think, I am able to affirm, that, in order to sow a strong clayey soil, the acorn should be kept in earth during winter, making a layer of two inches thick of acorns

acorns on a layer of earth of half a foot, then a bed of earth, and a bed of acorns, always alternatively, and at length covering the whole with a foot thick of earth, that the frost may not penetrate into it. The acorns are to be taken out in the beginning of May, and planted at a foot's distance. Those acorns which have burgeoned, are already so many young oaks, and the success of a plantation made in this manner is not doubtful; even the expence is not considerable, for one plowing only is necessary. If we could be secured from field-mice and other birds, we should succeed just in the same manner, and without any expence, by putting the acorn under the grass in autumn; for it pierces through and sinks of itself, and succeeds wonderfully, without any culture, in clayey ground where the turf is thin, close and very full, which generally indicates a firm soil, mixed with clay.

As I think that the best way of sowing trees in a strong soil mixed with clay, is to make the seed bud in earth; it is proper to remove our fears with regard to the small inconvenience which I have spoken of. The budded acorns are transported in hampers and baskets; and it is impossible to avoid breaking the radicles of many of these acorns, but that does them no other harm than retarding their coming out of the ground a fortnight, or three weeks, which, by the by, is not any harm; because that thereby we escape a much

more considerable injury, namely, that which the frost in the mornings of May does to the feed which have risen early. I have taken budded acorns, and I have cut the third, the half, the three fourths, and even the whole of the radicle; I sowed them in a garden where I could observe them every moment. They all rose; but those which were most mutilated, rose last. I sowed other acorns, from which I had not only taken away the radicle, but one of the lobes, and they rose too; but if you cut off both the shells, or if you cut the eye, which is the essential part of the embryo, they perish alike.

When experience has once taught us these facts, it is easy to explain them, but I again repeat, I confine myself in this Memorial to facts; sometime I lay my account, in a more extensive performance, to omit nothing of what may be interesting on this subject. In the other half of my ground which I have not yet spoken of, there is a district, the earth of which is much less strong than that I have described, and where it is even mixed with some stones a foot deep; this was a field which produced a great deal of corn, and had been well cultivated. I plowed it before winter; and in the months of November, December and February, I planted in it a numerous collection of all kinds of forest-trees, which I drew out of my copse woods, of all sizes, from three to ten and twelve feet high.

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A great part of these trees did not take root again, and a great number of those which set out leaves in the spring, perished during the heats of the month of August; many perished likewise the second, and others too the third and fourth years; so that, of all these trees, tho' planted and taken up with care, and even with uncommon precautions, I have only remaining some cherry-trees, lote-trees, wild Sarvice-trees, ash and elms; and even the Sarvices and ash are weak, they have not increased one foot in height these five years. The lotes are more vigorous; but the black cherry-trees, and elms have thriven best of all. This ground was covered in the summer-time with a vast quantity of weeds, whose roots destroyed many of my trees. I sowed likewise in this district some budded acorns, and the weeds choaked a great part of them; I believe, therefore, that, in good soils, which are of a middle nature between the strong and the light, it is proper to sow oats with the acorns to prevent the growth of these weeds, the most of which are rank, and are much more prejudicial to the oaks than oats, which give over putting forth roots in the month of July. This is a certain observation; for, in the very same soil, the acorns which I had sown with oats, had thriven better than the others. In the rest of my ground I planted young oaks, elms, and other young plants taken from my nurseries, which throve well.

I think then, I may conclude, from having examined into the matter, that it is money and time lost to pull up young trees in the woods, to transplant them in places where you are obliged to abandon them, and leave them without manuring; and that, when you want to make considerable plantations of other trees than oak and beech, whose seeds are strong, and get the better of almost every obstacle, you must make nurseries where you may raise and take care of the young trees during the two first years, after which you may plant them with success for making woods.

Having then got some little instruction, at some cost, in making this plantation, the next year I undertook to make another almost as considerable in quite different ground; the earth of it is dry, light, mixed with gravel, and the earth not eight inches deep, below which you find stone. I made a great many trials in it, the particulars of which I shall not mention; I shall content myself with warning, that these grounds must be tilled and sowed before winter. If you sow only in the spring, the heat of the sun kills the seed. If you content yourself with throwing or laying them on the ground, as in strong soils, they wither and perish; because the grass, which forms the turf of these soils, is not full and thick enough to secure them from the frost in winter, and from the sun's heat in the spring.

spring. Young trees which are drawn out of the woods thrive still worse in these soils, than in strong grounds; and if you would plant them, it must be done before winter with young plants taken from the nursery.

I should not forget to mention an experiment, which has an immediate relation to our subject. I was desirous to know the kinds of soils which are absolutely contrary to vegetation, and for this purpose I filled half a dozen large boxes for putting orange trees in, with quite different materials; the first with blue clay, the second with gravel as big as nuts, the third with clay of an orange colour, the fourth with potters earth, the fifth with white sand, and the sixth with cow's dung very rotten. I sowed in each of these boxes an equal number of acorns, chesnuts, and ash keys, and I left the boxes exposed to the air without looking after them and watering them; the ash-keys did not rise in any of these earths; in the box of blue clay the chesnuts rose and lived, but without making any progress. As for the acorns, a great number rose in all the boxes, except that which contained the orange coloured clay which produced nothing at all. I observed, that the young oaks which had risen in the blue clay, and the potters earth, altho' a little small at the top, were strong and vigorous in comparison with the rest; those which were in the rotten dung, sand, and gravel, were weak, had a yellow leaf,

leaf, and appeared languishing. In autumn I made two to be taken out of every box, the condition of the roots corresponded with the stalk; for, in the clays, the root was strong, and was not, properly speaking, but a large and firm pivot, three or four inches long, with only one or two ramifications. In the gravel, on the contrary, and in the sand, the root had lengthened out a great deal, and had divided itself prodigiously; it resembled, if I may express myself so, a long lock of hair. In the dung, the root had scarce an inch or two of length, and had divided itself, from its beginning, into two or three short and weak horns. It is easy to account for these differences; but I only want here to draw from this experiment, one useful truth, which is, that the acorn can grow in all soils. I will not conceal, however, that I have seen, in many provinces of France, lands of a vast extent covered with a small kind of heath, where I did not see an oak, nor any other kind of trees; the soil of these districts is as light and crumbly as black ashes, dusty, and without any cohesion. I have had no opportunity to make experiments on these kinds of earth; but I am persuaded, that, supposing oaks cannot grow in them, pines, firs, cypresses, and perhaps many other useful trees might thrive. I have raised seed, and I am actually cultivating a great number of these trees; I have observed that they re-

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quire a soil like that I have been describing. I am therefore persuaded, that there is no soil however bad, however ungrateful it may appear, of which advantage may not be made, even for planting wood; the whole matter would be to know the kinds of trees which would be proper for the different soils; but this knowledge supposes a great many experiments, and requires a number of observations. I have already made several, which I shall give the public an account of, in a treatise on the culture of all kinds of trees which can be raised in open ground. It is far advanced, and is the result of the experiments and observations which I have made in raising all these trees in a nursery. I did not confine myself to making a collection simply for curiosity, I multiplied, and I have actually nurseries filled with pines, firs, planes, cypresses, cedars of Lebanon, and all other kind swhich can be raised in open ground, of which I expect soon to make plantations at large. It is labouring for the public benefit to naturalize all these foreign trees, after the example of M. du Fay, to whom the public is so greatly obliged, since his having the direction of the King's garden.

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The Culture of FORESTS.

By the same AUTHOR

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The Culture of FORESTS.

July. 14. 1742.

IN the primary arts, which are indispensably necessary for life, such as agriculture, even the most unskilful persons, by dint of experiments, come at last to practise with advantage. The manner of cultivating corn, the vine, pulse, and the other productions of the earth which are reaped every year, is much better, and more generally known, than the method of keeping up, or cultivating a Forest. And, although the culture of fields should even be defective in many respects, it is however certain, that the methods which are established, are founded on experiments continually repeated, the result of which is a kind of approximation to truth. The Husbandman being instructed by his interest, which is ever new, learns not to be deceived, or, at least, to be but very little so, with

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regard to the means of rendering his land more fertile.

As the same interest guides men in every thing, it would be natural to think that they had given some attention to the culture of woods; yet nothing is less known, nothing more neglected. Wood appears to be a present from nature, and that we have no more to do but to receive it, just as it comes out of her hand. The necessity of improving it has not been sufficiently felt, and the manner of possessing it not being founded on experiments often enough repeated, the very simplest methods of preserving Forests, and increasing their produce, are still unknown.

I am far from intending to insinuate, that the inquiries and observations which I have made on this subject are admirable discoveries; I ought to advertise, on the contrary, that they are no other than common things; but their utility may render them important. I formerly communicated my observations on this subject in the year 1739 *. In this Memorial I shall extend these observations, by presenting some new facts.

The produce of any soil may be measured by its culture. The more that land is laboured, it produces the more fruit; but this truth, which in other respects is so useful, is liable to some exceptions; and in woods, a culture which is premature and not properly understood,

* *Vide* the preceding Memorial.

flood, is the cause of scarcity, instead of producing plenty. For example, it is commonly imagined, and I was long of opinion, that the best method of putting ground into the nature of wood, is to clean the ground, and to cultivate it well, before that the acorns or the other seed are sown, which are intended to cover it, some time, with wood ; and I was not undeceived in this prejudice, which appears so reasonable, but by a long series of observations. I have sown, considerably and have made pretty large plantations, and all with great precaution. I have often caused to pluck out the junipers, heath, and even the very smallest plants which I looked on as hurtful, in order to cultivate thoroughly, and with several plowings, the soils which I was wanting to sow. I made no doubt of success from all this care ; but at the end of some years I discovered, that this very care had only served to retard the growth of my young plants, and that this preceding culture which had given me so great hopes, had been the occasion of considerable losses to me. In ordinary cases, expences are laid out in order to gain, but in this, expences are prejudicial. If we could wish then to succeed, in making wood grow in any kind of soil whatsoever, we must imitate nature, we must plant and sow in it thorns and bushes to break the force of the wind, to diminish the intenseness of the frost, and to be a fence against the inclemency

clemency of the weather. These bushes are so many shelters to secure the young plants, and to protect them from the heat of the sun, and the rigour of the hoar-frosts. Ground which is covered, or rather half covered with junipers and heath, is already a wood half made, which possibly has the better of a soil that is clean and cultivated, by ten years. I shall now relate the observations which have ascertained this fact.

I have two pieces of land of about 40 arpents each, which have been sown into wood these nine years : these two pieces are surrounded on all sides by copse-wood, one of the two was a well cultivated field. Several districts in this piece were sown equally, and at the same time, some in the middle of the piece, others along the copse-wood ; all the districts in the middle are dispeñished ; all those which border upon the wood are well furnished. This difference was not sensible the first year, not even the second ; but the third year I perceived a small diminution of the number of the young plants in the middle districts, and having observed them exactly, I saw that every summer and every winter of the following years a considerable number of them perished, and the strong frosts of 1740 compleated the ruin of these districts, whilst all those which extend along the copse woods are flourishing : here the young trees are green and vigorous, all planted the one over against the other,

ther, and they have risen without any culture to four or five feet in height: it is evident that they owe their growth to the neighbouring wood, which has served as a shelter to them from the injuries of the seasons. This piece of 40 arpents is at present surrounded with a ridge, of about five or six perches broad, of a growing wood which promises much. In proportion as you move to go towards the middle, the ground is less ploughed, and when you come to ten or twelve perches distance from the copse woods, it is scarce possible to perceive that it had been planted. The sole cause of this difference proceeds from its being exposed too openly, for the soil is absolutely the same in the midst of the piece, and along the wood, and these soils had received the same culture at the same time, and they had been sown in the same manner and with the same seed. I have had occasion to repeat this observation in sowing plots of a larger extent, in which I discovered, that the middle is always unfurnished, and that whatever attention may be had to sow again this part of the ground every year, it cannot be covered with wood, but remains absolutely lost to the proprietor.

To remedy this inconvenience, I have caused two ditches to be made, which cut one another at right angles in the middle of these pieces, and I have made thorns, poplar and other white wood, to be planted all along

these ditches. This shelter, although thin, has answered the purpose of securing the young plants which are next to the ditch, and by this little expence, I have prevented the total loss of the greatest part of my plantation.

The other piece of 40 arpents, which I have mentioned, was, nine years ago, made up of 20 arpents of a clean soil and well cultivated, and of 20 other *arpents* uncultivated, and covered over with a great number of junipers and thorns: I caused the greatest part of these two soils to be sown at the same time; but as that which was covered with junipers could not be cultivated, I contented myself with throwing acorns with my hand, under the junipers, and I made the acorns to be put under the turf, in the open places, by means of a single thrust of the dibble. They had even been sparing of the seed, being uncertain of success, and I had been very lavish of it in the cultivated ground. The event was quite different from what I had imagined. The open, and cultivated ground was covered, the first year, with a great number of young oaks; but this number diminished by degrees, and it would have been at present almost reduced to nothing, had not I been at particular pains to preserve the remainder of it. On the other hand the ground which was covered with thorns and junipers, is just now a little wood, where the young oaks have

ripened

risen five or six feet high. This observation proves, still better than the first, how much shelter is necessary for the preservation and growth of young plants; for I preserved those which were in the too open ground in no other way but by planting, in the spring, slips of poplars and thorns, which after taking root, made a little covert, and defended the young oaks which were too weak of themselves to resist the rigour of the seasons.

To convert then into wood, a field or any other cultivated ground, the greatest difficulty is in making the covert. If a field is neglected, nature will require twenty or thirty years to make thorns and junipers grow in it; here a culture is necessary, which, in a year or two, may put the ground into the same condition in which it is after lying thirty years uncultivated.

I have made different trials on this subject. I have made the thorn, junipers and several other seeds to be sown along with the acorns; but these seeds require too long time to rise, the most part of them remain in the earth for two years. I have likewise tried to no purpose, seeds which appeared to me to be more forward; the willow is the only seed which succeeds and grows pretty readily without culture. But I have found nothing better for making a covert, than to plant slips of poplar, or some feet of aspin, at the same time that you sow the acorn in a wet soil; and, in dry soils, thorns,

thorns, alder, and some feet of Virginia Sumach. This last tree especially, which is scarce known to any but Botanists, multiplies from suckers with such facility, that one foot of it, in a garden, will be sufficient to admit of transporting, into one's Plantations, a great number from it every year; and the roots of this tree, extend so far that a dozen of feet of it, in an *arpent*, is sufficient to furnish a covert at the end of three or four years: Only it will be proper to observe to make them to be cut, even to the ground, the second year, in order to make them shoot forth a greater number of suckers. Next to the Sumach, the aspin-poplar is the best; for it shoots out suckers 40 or 50 paces, and I have filled several places of my plantations only by causing some aspins to be filled which were there by chance. It is true that this tree is not easily transplanted, which must make the Sumach preferable. Of all the trees that I know, this is the only one which grows and multiplies to such a degree, as to fill ground in a very short time; its roots run up almost to the very surface of the earth, and therefore do no harm to those of the young oaks which sink deep into the ground. There is no reason to fear lest this Sumach or the other bad kinds of wood, such as the Aspin, the Poplar and the willow should hurt the good kinds, such as the Oak and the Beech. These are only weak in their youth, and after passing the first

first years under the shade and shelter of the other trees, they will soon rise above them, and becoming the strongest, they will choke every thing that surrounds them.

I have already said, and I repeat it, land cannot be too much cultivated, when it yields every year the fruit of our labours; but when we must wait five and twenty, or thirty years before we can enjoy, and when we must be at a considerable expence before we arrive at this enjoyment, we have reason to examine, and perhaps we have reason to grow weary. A stock is only valuable in proportion to its revenue; and what a difference is there between an annual revenue, and one that is remote, and even uncertain.

I was desirous to become certain, by constant experiments, of the advantages of culture with regard to wood; and, in order to arrive at a precise knowledge in this, I caused some acorns to be sown, in a garden, of the very same nature with those I had sown in my woods, in the same quantity and at the same time. The latter I abandoned to the care of nature, and I cultivated the former with all the rules of art. In five years, the oaks of my garden had got a trunk ten feet and two or three inches diameter, and a head sufficiently furnished to allow one to sit under its shade. Some of these trees have even produced fruit the very fifth year, which being sown at their fathers' foot, have produced other

other trees which were indebted for their birth to the strength of an assiduous and studied culture. The oaks of my woods which had been fown at the same time, were, after five years, no more than two or three feet high, even the most vigorous of them; for the greatest part were not one foot high, their trunk was just about as big as the finger, they were shaped like a little bush, and their bad figure, so far from promising an offspring, left it in doubt whether they should have strength enough to preserve themselves. Encouraged by the success of this culture, and not being able to suffer the abortions of my woods, when I compared them with the trees in my garden, I even laboured to deceive myself with regard to expences, and I took in hand to form a pretty considerable district in my woods, where I could raise the trees with the same care as in my garden. There was nothing less to be done, than to trench the ground two feet and a half deep, to cultivate it at first like a garden, and for ameliorations, to cause to be conducted into this ground, which appeared to me a little too firm and too cold, more than two hundred carts of bad waste wood and chips, which I made to be burnt upon the spot, and the ashes mixed with the earth. This expence already greatly exceeded the quadruple of the value of the ground, but I was satisfied, and was desirous to have wood in five years. My hopes were

were founded on my own experience, on the nature of a soil chosen out among a hundred others, and still more on the resolution of sparing nothing in order to succeed, for it was a trial: I was however deceived. I was obliged, the very first year, to give up with my ideas, and the third I abandoned this ground with a disgust equal to the eagerness which I had had to cultivate it. None will be surprised at this, when I inform them that the very first year, besides a thousand enemies whom I had to combat, such as field-mice, birds, &c. the number of weeds was so great, that we were obliged to be continually weeding, and that in doing this with the hand, and with the greatest precaution, we could not however prevent the roots of the little growing trees from being disturbed, which did them a sensible prejudice. I then remembered, but too late, the observation of the gardeners who expect nothing from a new garden the first year, and who have a great deal of difficulty, in the first three years, to purge the ground of the weeds with which it is filled. But this was not the greatest inconvenience. Water failed me during the summer, and not being able to water my young plants, they suffered so much the more from this, that they had been much accustomed to it; besides, the great care with which the weeds were taken out, joined with reiterated labours, had rendered the ground clean, and towards

wards the end of summer, the land had become scorching and of a terrible drought; which would not have happened if it had not been so often cultivated, and if the weeds had been left which had grown from the month of July. But the irreparable injury was that which was occasioned by the frost of the following spring. My ground, though well situated, was not far enough removed from the woods, to hinder the transpiration of the growing leaves of the trees from spreading to my young plants: this moisture accompanied with a North wind, made them freeze on a 16th day of May, and from that day I lost almost all my hopes. However I was not willing as yet to abandon my project altogether. I endeavoured to remedy the evil caused by the frost, by making all the dead, or sick parts to be cut off. This operation was of great service, my young trees resumed their vigour, and as I had only a certain quantity of water to give them, I reserved it for what most necessarily stood in need of it. I also diminished the number of plowings, for fear of drying up the earth too much, and I had reason to be sufficiently satisfied with the success of my attention to these small things. The rise of the sap in August was abundant, and my young plants shot forth more vigorously than in the spring: but the principal aim was wanting, the great and quick growth, which I desired, was reduced to the fourth

part

part of what I had expected, and of what I had seen in my garden. This greatly slackened my keenness, and I contented myself, after making my young plants to be lopped, with giving them two plowings the next year, and even there was a space of about a quarter of an *arpent* quite neglected, and which received no culture. This neglect was worth a discovery to me, for I observed with some surprise, that the young oaks of this district were as vigorous as those of the cultivated district; and this observation changed my ideas on the subject of culture, and made me abandon this ground which had cost me so much. Before quitting this subject I should take notice that these cultures have, however, made the growth of the young trees to advance considerably, and that I have not been deceived with regard to this but in a small degree; but the great error of all this is the expence, the produce is not at all in proportion to it, and the more money that one spends on a soil which he intends to convert into a wood, the more he is deceived; it is an interest which decreases, the greater the stock is that is laid out on it.

We must then turn our views to another side; the expence becoming too great, we must give up with these extraordinary cultivations, and even those cultivations which are commonly given to the young plants twice a year by gently throwing up the earth under

them. Besides some real inconveniences which attend this last kind of cultivation, that of the expence is sufficient to disgust any one from it, especially if any thing better, and which will cost a great deal less, can be substituted in its stead.

The only method of supplying the want of plowing, and almost all other kinds of culture, is to cut the young plants even near to the earth. This method, as simple as it appears, is of an infinite advantage, and when it is seasonably put in practice, it accelerates the success of a plantation many years. Allow me to enter a little more particularly into this subject, which, perhaps, will not prove displeasing to the lovers of agriculture.

All soils may be reduced to two kinds, namely, strong and light. This division, however general it may be, will answer my purpose. If a light soil is intended to be sowed, it may be plowed. This operation has the greater effect, and is attended with less expence, in proportion to the lightness of the soil. One single plowing is necessary, and the acorn is sowed following the plough. As these soils are generally dry and scorching, the weeds which the following spring produces must not be plucked up; for they retain a gentle coolness, and preserve the small oaks from the heat of the sun; and when they come afterwards to perish and wither in autumn, they serve for stubble and a shelter during winter,

winter, and prevent the roots from freezing. No sort of culture therefore is necessary in those sandy soils. I have sowed into wood a great number of *arpents* of this kind of soil, and I have succeeded beyond my hopes : the roots of the young trees finding a light earth easy to be divided, extend themselves, and take advantage of all the juices which come in their way, and the rains and dews easily penetrate to their roots. There is need only of a little covert and shelter to make a plantation to thrive in soils of this kind. But it is a much more difficult matter to make wood grow in strong soils ; a quite different method must be used. In these soils the first plowings are useless and often hurtful. The best way is to plant the acorns with the dibble without any preceding culture ; but you must not abandon them, like the first, so far as to lose sight of them, and to think no more of them ; on the contrary, you must visit them often ; you must observe the height to which they shall have risen the first year, then observe if they have shot more vigourously the second year than the first, and the third than the second. As long as their growth goes on increasing, or even as long as it preserves itself on the same footing, you must not touch them ; but you will generally perceive, the third year, that the growth begins to diminish, and if you wait till the fourth, fifth, sixth, &c. you will discover,

that the growth of each year is always less ; so that how soon you shall perceive that, without frost, or other accidents intervening, the young trees begin to grow from less to less, you must cut them even to the ground in the month of March, and you will gain a great many years. The young tree left to itself, in a strong and close soil, cannot extend its roots ; the earth being too hard, makes them press upon one another ; the small, tender, and herby fibres which should nourish the tree and form the new production of the year, cannot penetrate through the too firm substance of the earth ; so the tree languishes, being deprived of nutriment, and the annual production often diminishes even so far as to put forth nothing but leaves and some buttons. If you cut this tree, all the strength of the sap is carried to the roots, it opens all their young shoots, and acting with more violence against the ground which resists them, the young roots open to themselves new passages, and by the increase of their strength divide the same earth which they had attacked in vain before ; they find nourishing juices in it in abundance, and how soon they are settled in this new country, they shoot out with vigour the superabundance of their nutriment, and produce, the very first year, a shoot more vigorous and higher than the old trunk was after three years. I have repeated this experiment so often

often that I can give it as a certain fact, and the most useful practice that I know in the culture of woods.

In a soil which is only firm without being too hard, it will be sufficient to cut the young plant only once to make it thrive. I have pretty considerable districts of a firm and tough earth, on which the young plants have been cut only once, and yet grow wonderfully, and I shall have underwood in them, fit for cutting, in some years. But I have observed, in another place, where the earth is entirely strong and hard, that having made my young plants to be cut the second year, because they were languishing, this has not prevented us from being obliged to cut them a second time at the end of four other years; and I am just going to relate another experiment, which will shew the necessity of cutting twice in certain cases.

These ten years I have planted a very considerable number of trees of several kinds, as Elms, Ash, Yoke-elms, &c. The first year all those which took, shot pretty vigorously; the second year, they shot more weakly; the third year, they were still more languishing. Those which appeared to me to be most out of order, were such as were the biggest and the oldest, when I made them to be transplanted. I saw that the root had not strength to nourish those great trunks, which determined me to make them to be cut; the following

L 3 years

years I caused the same operation to be made on the smallest, because their decay became so great, that, without quick assistance, we should have had no reason to entertain any hopes of them. This first cutting renewed my trees, and gave them much vigour, especially during the two first years; but the third year I perceived a small diminution in the growth, which I attributed to the temperature of the seasons that year, which had not been so favourable as that of the former years; but I discovered clearly, during the following year, which was favourable for the plants, that the evil was not solely occasioned by the intemperature of the seasons; the growth of my trees continued to diminish, and would have always diminished, as I was made certain of by leaving some of them standing, if I had not made them to be cut a second time. Four years are now expired since this second cutting, without any diminution of the growth; and those trees which are planted in ground which has been cultivated for more than twenty years, and which have never received any culture around them, have as much strength and as strong a leaf as trees of a nursery; an evident proof, that cutting, when done seasonably, can supply the want of all other culture.

The authors on agriculture are very far from being of the same opinion with us on this subject. They all repeat after one another,

ther, That, in order to have a wood of high trees, and of a fine growth, we must take great care not to cut the top of the young plants, and that we must be very attentive to preserve the *mounter*, that is to say, the principal shoot. This advice is only good in certain particular cases; but it is a general truth, and I can affirm it after a very great number of experiments, that nothing is more effectual for making trees strait, and for giving them an upright and clean trunk, than cutting them all around. I have even observed that woods of high trees, produced from seed or young plants, were not so beautiful nor so strait, as the woods of high trees which were produced on young stocks; therefore, there is no reason to hesitate to practise this kind of culture, which is so easy and which costs so little.

It is not necessary to advertise, that it is still more indispensable, when the young plants have been frosted; for there is no other method to re-establish them, but by cutting them. It would have been proper, for example, to have cut all the copses of two or three years standing which were frosted in the month of October 1740, for an Autumn-frost never did so much harm. The only method of remedying this is by cutting, by which we sacrifice only two or three years not to lose ten or twelve.

To

To these general observations on the culture of wood, let me join some useful remarks, which ought even to precede all kind of culture.

The Oak and the Beech are the only trees, except the Pine, and some other of less value, which can be sowed with success in uncultivated lands. The Beech may be sowed in light soils. The seed cannot come out in a strong earth, because it shoots out its cover above the growing trunk; therefore it must have a pliant earth which will divide, otherwise, it remains in the ground and rots. The Oak may be sowed in almost all kinds of soils: In the year 1739, we proposed different methods, according to the different soils: All other kinds of trees require to be raised in nurseries, and afterwards transplanted when two or three years old. Care must be taken not to put trees together which do not agree: The Oak fears the neighbourhood of the Pines, Firs, Beeches and all the other trees which shoot great roots into the depth of the soil. In general, in order to draw the greatest advantage from ground, you must plant trees together, which draw their substance from the bottom, by shooting their roots to a great depth, and other trees which can draw their nutriment almost from the very surface of the earth, as are all those trees whose roots extend, and run only some inches deep without penetrating farther.

When

When you intend to sow a wood, it will be proper to wait for a year abounding in acorns; not only because they are best and cheapest, but likeways as they will not be destroyed by the Birds, the Field-mice, and the wild Boars, who finding plenty of acorns in the forests, will not come to attack your plantation, which they never fail to do in years of scarcity. It is not to be imagined to what a pitch Field-mice alone can destroy a plantation: About two years ago I had made one of fifteen or sixteen *arpents* I had sown in the month of November; after some days I perceived that the Field-mice were carrying away all the acorns. They dwell alone, often two and sometimes three in the same hole. I made some of their holes to be laid open, and I was frighted at seeing in each hole, half a bushel, and often a whole bushel of acorns, which they had heaped up to maintain themselves during the winter. I immediately ordered a great number of traps to be laid in this district, in which all the bait that was put was a broiled acorn. In less than three weeks time they brought me near thirteen hundred Field-mice. I relate this fact only to shew how dangerous they are, both on account of their number, and for their foresight in laying up in their holes as many acorns as they can get.



